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Some Problems of the Textile Chemist*

The Chemist in Textile Manufacturing—The Problem of the Mills—The Textile Chemist Works with Cellulose—Regenerated Cellulose—Effect of Metals on Dyes—Acetate Rayon

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IT is the purpose of this paper to consider only textiles of vegetable origin. The recent programs of the Cellulose Section have not contained papers of direct significance to textile chemists. So far as this writer knows, there has been no general interest on the part of the textile chemists to attend the meetings of the Cellulose Section, although some of them have been attending the meetings of the Dye Section. There is, however, a need among textile chemists for greater knowledge in the field of fundamental carbohydrate chemistry, and it is hoped that the Section may also be benefited by hearing of the problems confronting those engaged in the textile industry at the present time. This paper is designed to promote a mutual interest between the textile chemists and the other carbohydrate chemists. Before we take up concrete problems of the textile chemists we must deal for a moment with the textile industry as is, in order to orient those who have not had opportunity to study the situation.

The Place of the Chemist in Textiles

The skilled workers in this industry are largely members of the American Association of Textile Chemists and Colorists, the membership in 1928 containing some eight hundred and fifty names. In addition there are 148 junior members, that is, members who have not been in textile work five years. Membership is not limited to chemists, but is open to dyers, colorists, executives and salesmen. In addition, dyestuff manufacturers are welcome and the sales and chemical staffs on such concerns as Du Pont, Newport, General, Ciba, etc., are represented.

The chemists in the textile field are conveniently grouped into six classes,[10] as follows:

1. Chief chemists.
2. Dye chemists.
3. Colorist chemists or print works' chemists.
4. Process chemists.
5. Research chemists.
6. Consulting chemists.

There are 45 chief chemists; 195 dye chemists; 51 colorist chemists; 130 process chemists; 12 research chemists; and 13 consulting chemists, according to the listings in the year book of the A. A. T. C. C. of 1928. This does not include any chemists who may be at the present time in an executive position such as assistant—or general—superintendent. While it does not necessarily follow that a research chemist never does any trouble shooting or process work, yet the majority of his efforts should be spent on new problems. Also, it follows that while the process chemists may do some original work the major portion of their time is spent on routine. Consequently, the most of the original work in the textile plants, especially as pertains to fundamental carbohydrate chemistry, is being done at the present time by these two groups, only one of which spends practically full time on research. There were in 1923 about 160 [2] finishing and dyeing plants handling cotton piece goods, in addition to those plants handling cotton yarns. In addition, there were 66 plants handling silks and woolens. Excluding the dyers, colorists and superintendents, these 226 plants employ 187 chemists to do executive, routine and research work. It is true that all the textile chemists do not belong to the A. A. T. C. C. and so these figures can only be approximate for the entire profession. These statistics indicate in a fair way the extent of the fundamental research being done at the present time, and suggest that all the mills have not as yet adopted the policy of increasing their technical staffs. Fortunately, there are some important exceptions and the next decade will enable the textile chemist to prove his value to the industry.

*Read before the Cellulose Division of the American Chemical Society at Columbus, Ohio, April 30, 1929.

The Problem of the Mills

There is a good reason why the textile mills have been slow to increase their technical staffs. A survey of the past and present problems of the mills will give much food for thought and help to explain the present situation in the textile industry. In our current business magazines the great cry is for mass production. From automobiles to farming, the one thought is consolidation and large scale production. This connotes a large volume of business on a fair margin of profit.

Up to ten years ago the textile business was one of mass production. Semi-annual openings were held in Boston or New York and buyers from all over the country came to these openings. They purchased supplies for six months retail and it was not infrequent that the entire future six months' production of a mill was sold out in one day, nearly always in two. The mill executive could then classify his orders, consolidate them and assign a particular volume of business to a particular machine; he could then look ahead to stylings for the following half year. This was mass production in textiles and gave solidity to the industry.

At the present time this has changed. There are no more openings. Mass production has passed and mills are operating largely on novelties or fads. This means special designs, multi-colored prints, short orders, less speed and higher overhead. The greatest handicap is the demand of the purchasers for immediate delivery. This precludes grouping smaller delivery orders into one large manufacturing order, eliminates mass production, builds up manufacturing costs, and reduces profits to the isoelectric point. It is no wonder that the harassed mill executive in his spare moment dreams of the good old days of mass production.

This change in production methods has increased the work of the mill chief-chemist to the point where he has been forced to expand his laboratory. For the moment his entire attention has been focused upon the necessity of keeping up with production. However, among the many problems which have arisen he has found some that are not so easily solved and he has begun to seek the services of research chemists to assist him in his studies of carbohydrate chemistry. We are at the threshold of a new era in textile chemical research and it is for this reason that the Cellulose Section can be of assistance to the textile chemist from now on.

The Textile Chemist Works with Cellulose

In the first place, the textile chemist is concerned with the constitution of cellulose. As it is the basic material with which he works, there is every reason why he should be interested in its constitution. Such processes as mercerization, organdy-finish and immunized cotton are possible because of the action of various reagents on the cellulose molecule. Complete knowledge will make additional methods of finishing possible.

The term oxycellulose is also a word to cause stout hearts to grow faint in the carbohydrate industry. A companion term as little understood as oxycellulose is hydrocellulose. Little success has attended the efforts of investigators to learn the true identity of oxycellulose. We have the conclusions of Nastjukoff [3] that there are three types of oxycellulose; alpha-oxycellulose, which is insoluble in dilute alkalies; beta-oxycellulose, which is soluble in dilute alkalies, and gamma-oxycellulose, which is soluble in water. Birtwell, Clibbens & Ridge [4] think that there are two kinds of oxycellulose—one having a high copper number and a low Methylene Blue number; the other having a low copper number and a high Methylene Blue number, or, to put it another way, the oxycellulose formed from an acid solution is different from that formed in an alkaline solution. Prof. Bancroft [5] believes that there is only one oxycellulose, but that is it capable of existing in different degrees of dispersion.

One of the main reasons for the failure of workers to identify degraded carbohydrates is probably due to the lack of an accurate method of analyzing for this product. The writer [6] has shown that the use of alkaline copper tartrate solution does not give reliable results on carbohydrates of lower molecular weight, and Staud and Gray [7] have shown that the same method is unreliable for cellulose cubes made up into different sizes.

The evidence at present seems to indicate that the degraded cellulose molecule is further broken up by caustic soda, the freed valence attaching itself readily to oxygen if it is present. If it is not present, two of these free valences combine to form a polymer, which has less reducing power in alkaline copper tartrate solutions. Until a successful method of estimating degraded cellulose is found, considerable doubt will attend the accuracy of any quantitative determinations of degraded cellulose. It is to be hoped that the recent method of Staud and Gray [8] in which the modified cellulose reacted with phenylhydrazine acetate will lead to more fruitful results.

Regenerated Cellulose

Another problem of interest to the textile chemist is that of regenerated cellulose. Viscose, cuprate and cellulose nitrate are representatives of regenerated cellulose. Because of its relative cheapness, viscose has been the favorite. Two objections to viscose which are serious are (1) the weakening of viscose in wetting, and (2) the possibility that some viscose may dye up different shades in the same dye bath. The most recent tests which we have carried out in our laboratory on this weakening effect of water indicated a loss of 59.4%.[9] When one remembers the not too ancient garment which stretched so much that a few inches had to be removed from the bottom periodically, the present-day production is infinitely superior. But the loss of strength on wetting is still a source of trouble.

The control of the uniformity of regenerated cellulose in

the viscose process is not as successful today as it will be in the future, we hope. Frequently, hanks of yarn will contain a knot and the two ends will give a difference in shade when dyed in the same bath. This undoubtedly is due to a lack of proper control of the viscose in its various stages of manufacture. Probably there are rayon chemists present who can explain the reason for it. It is quite a problem in the manufacture of well-appearing viscose fabric.

If I may be permitted to digress for a moment from pure carbohydrate chemistry, I would like to mention two problems which are quite important to the textile chemist and show the ramifications of such problems. They concern the manufacturer of cotton piece goods from gray cloth and are very important. The first of these two problems is aging.

When cotton cloth is received from the weave shed it contains 6 to 8% of impurities, including waxes, tannin, and sizing, which has been added to the warp yarns to make weaving easier. Before this cloth is printed or dyed, these impurities must be removed. After they are removed the cloth is ready for printing. Present-day standards demand considerable color fastness in prints, so vat dyes are largely used for this purpose. Inasmuch as these dyes are insoluble in the oxidized state, and so will not penetrate the fiber they are mixed with sodium sulphoxalate formaldehyde, a reducing material, and then with starch pastes and gums which serve two purposes, (1) to glue the color to the cloth; (2) to increase the viscosity of the colors so they will not run or smear. At this stage the color has not penetrated the cellulose and to accomplish this penetration the whole thing is aged or steamed. During this aging, the vat dye is reduced by the sodium sulphoxalate formaldehyde and it then penetrates the fiber. Consequently, the color paste must be moistened to give a medium in which this reduction may occur and be heated to accelerate the reaction. This reaction is heterogeneous and exothermic. This would indicate that once started, the end should be reached quickly. However, if a condition of superheat is reached, the loss of moisture in the paste which contains the colors and the reducing agent apparently retards the reaction velocity or perhaps stops it altogether.

Effect of Metals on Dyes

Another problem of theoretical interest is the effect on dyestuffs of the various substances used in making dye vats, pad boxes and jigs, such as iron, steel, Monel, brass, etc. I do not mean to imply that all these materials are at present used in making these dye bath containers, but the realization that one metal reacts[10] with one dye has naturally brought up the question of the effects of metals on dyestuffs in general.

It is the custom for dyestuff manufacturers to give textile mills the proper directions for using a dyestuff. If the dye submitted and used according to these directions does not give the effect desired, the dyer will likely reject it, probably feeling that the dye was no good. Fortunately the dyer is finding that his methods may also be a contributary cause in the failure to get the correct result and he is at the present time very much on the alert.

The last of the problems which I will mention as of interest to carbohydrate chemists concerns that new combination with cellulose commonly called cellulose esters, the oldest of which is acetate-rayon. The textile chemist as well as his colleague, the dye chemist, should, and does, thank the research chemist for opening up this interesting field. All the problems connected with acetate rayon have been novel. Very few of the then-known dyes had affinities for Celanese and three lines of new dyes have been developed for this fiber.

Cellulose acetate rayon of 150 denier is weaker than the regenerated cellulose yarns of the same denier, but is less susceptible to the weakening effect of water, losing only 40% of its strength when wet out. This resistance to weakening when wet may result in Celanese or some other yet-to-be-discovered cellulose-ester superseding viscose, if the price factor can be controlled.

Celanese can be delustered or converted into a beautiful dull white. This is usually done by heating with a weak soap solution, but dilute acids and 0.05% Borax solutions may also accomplish the same result. Such delustered material appears to have a roughened surface when examined microscopically and this is the explanation generally given. These "rough" spots appear as small "specks." It is doubtful if this explanation is the real one, however, as the cross-section also shows these "specks" when viewed microscopically, indicating that the action has occurred throughout the fiber.

The Celanese can be relustered by treating with an acid such as glycolic. This relustering is accompanied by a loss in weight which indicates that something has been dissolved from the fiber. If a relustered piece of delustered Celanese is examined in cross-sections, it will be seen that these so-called specks have been practically completely removed. If the delustered Celanese is heated to 150°F. with 5% NaOH, the specks are removed at first from the outside and then towards the interior. This heating with NaOH is called saponification and is generally avoided as regenerated cellulose is the result. The filament likewise has lost its original properties and can now be dyed with direct dyes. As yet the chemistry of delustering and relustering has not been satisfactorily explained. Although Celanese is the first and foremost cellulose ester, there is every reason to believe that others will follow. With their advent the textile chemist will have many new and varied problems.

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SENATE COMMITTEE ANNOUNCES CHANGES IN THE TARIFF

Indigo and Sulphur Black Rates Lowered Sharply —United States Value Adopted by Committee

A SLOW-MOTION picture camera would be needed to record all the rapid changes of the past two weeks in the tariff situation. Many rates have been moved upward, many downward by the Senate Finance Committtee. Certain administrative features have been revised. Attitudes have shifted. New oppositions to the tariff as a whole and to certain parts have revealed themselves.

To be specific: the tentative revisions in rates made on all schedules by the Senate Finance Committee were published August 19. The one change most significant to the American dyestuff industry and its consumers is the reduction in both specific and ad valorem rates on Indigo and Sulphur Black. According to the Senate's version of the pending bill, the specific duty on these two bulk colors is now fixed at 3 cents per pound and 20% ad valorem.

In the 1922 Tariff now in force the rates on all coal-tar dyes are, as readers well know, 7 cents per pound and 45 cents ad valorem, based on American valuation in the case of competitive products and on United States value in the non-competitive dyes. The House, in its completed draft of the Hawley-Smoot measure, made no reduction in these rates. But the Senate Committee has now seen fit to discriminate against Indigo and Sulphur Black with a reduction that is regarded in some quarters as drastic.

The second item in the Senate Committee's re-written tariff that is of momentous interest to the dyestuff industry and its consumers is the retention of American selling price as the basis of valuation in the dye paragraphs. There had been some danger that this basis, regarded by the domestic manufacturers as so very essential, might possibly be removed during the Senate Committee's operations on the pending bill.

In the Senate version there are 431 changes in rates made in the House draft of the tariff. It is further stated that 59% of these changes represent decreases from the House rates. The Senate Committee made revisions in all of the 15 commodity schedules.

Discussing the Chemical Schedule, a writer in the New York Journal of Commerce remarks, "The appearance of the rates in the Senate version of the tariff bill does not serve as a guarantee of their permanent retention therein." This is merely to say that further changes may be inserted when the bill comes before the Senate itself.

Committee Adopts U. S. Value

During a meeting of the Senate Finance Committee held August 21, a majority of Republican members of the Committee adopted a proposal to translate all the rates of duty now based on foreign valuation into rates based on domestic or United States value. These members, at the same time rejected the proposal made in the House bill which named the Secretary of the Treasury as the final arbiter on valuation in all disputes over the appraisal of imports. The Committee then adopted a motion of Sen. James Couzens that all reports of the Tariff Commission on valuation be submitted to Congress, and not to the President, for approval. Such reports are submitted in connection with decisions rendered under the flexible provisions, which permit rates to be lowered or raised to the extent of 50% to equalize the conditions of competition in the domestic market.

The Senate Committee, in connection with its adoption of United States value as a basis for rates other than those in the Dye Paragraphs, also ordered the Tariff Commission to submit a report to Congress not later than January 1, 1932, setting forth the classes of articles on which the conversion of rates has been made. This action merely passes on to the Congress of 1932 the full responsibility of adopting finally the changes in rates caused by this shift in valuation.

After a thorough discussion of the flexible provisions, in which agreement was reached only on certain features of this item, the Republican members of the Committee at last completed their labors on the administrative sections of the tariff. This was the signal for adjournment until September 4. At that time the Democratic members of the Senate Committee will be asked to cast their votes on reporting the bill to the Senate.

Senator Smoot, one of the fathers of the tariff, in a statement made August 24, said he hoped the pending measure would be adopted before Congress convenes in regular session next December. It is expected that this week or next Senator Smoot will issue an official explanation of all the changes made by his committee in each schedule of the bill. On the other hand there are intimations that final passage of the tariff will be greatly delayed. This possibility is seen in the proposal of Senator Thomas to strike out all parts of the new tariff except the agricultural schedules and new administrative features, in order to achieve a strictly limited revision.

J. Bynum Merritt, for twenty years associated with the Hunter Manufacturing & Commission Company, and more recently identified with the Iselin-Jefferson Company, of New York, has acquired a heavy interest in the Southern Silk Mills, of Greensboro, N. C., and will become active in the management on January 1, he announces. Recently the silk manufacturing company increased its capital to $500,000 to provide for the expansion of the plant in the near future. Since opening in 1925, the mill has tripled its equipment and output.

Principles of Professional Conduct

American Institute of Chemists

IN general it may be said that the same high degree of honor and dignity should be maintained by textile chemists as by chemical engineers. Furthermore, textile chemists are entitled to a similar recognition of position and responsibility as are the chemical engineers. After several years of study of the whole subject, the American Institute of Chemists adopted the following code to definitely guide them as to professional conduct and ethics. We print herewith this code believing that it should be of vital interest to many readers of the AMERICAN DYESTUFF REPORTER.

1. Every individual on entering the profession of chemistry and thereby becoming entitled to full professional fellowship, incurs an obligation to advance the science and art of chemistry, to guard and uphold its high standard of honor, and to conform to the principles of professional conduct.

2. It is the duty of a chemist to bear his part in sustaining the laws, institutions, and burdens of his community.

3. The chemist shall not knowingly engage in illegal work or co-operate with those who are so engaged.

4. A chemist shall carry on his professional work and act in a strict spirit of fairness to employers, contractors and clients, and in a spirit of personal helpfulness and fraternity toward other members of the chemical profession.

5. He shall refrain from associating with or allowing the use of his name by any enterprise of questionable character.

6. He shall advertise only in a dignified manner, being careful to avoid misleading statements.

7. He shall co-operate in upbuilding the profession by exchanging general information and experience with his fellow chemists and by contributing to the work of technical societies and the technical press, where such information does not conflict with the interests of his client or employer. It is very desirable that the first publication regarding inventions or other scientific advances be made through the technical societies and technical publications and not through the public press. Care should be taken that credit for technical work be attributed as far as possible to the real authors of the work.

8. If, in his opinion, work requested of him by clients or employers seems to present improbability of successful results, he shall so advise before undertaking the work.

9. He shall be conservative in all estimates, reports, testimony, etc., and especially so if these are in connection with the promotion of a business enterprise.

10. He shall not accept compensation, financial or otherwise, from more than one interested party without the consent of all parties concerned and shall not accept commissions from outside parties and sales to his client or employer without their knowledge. He is, however, in no way debarred from accepting employment from more than one employer where there is no conflict of interests.

11. He shall not use any unfair, improper or questionable methods of securing professional work or advancement and shall decline to pay or to accept commission for securing such work.

12. He may use all honorable means in competition to secure professional employment but shall not, by unfair means, injure directly or indirectly, the professional reputation, prospects or business of a fellow chemist and shall not attempt to supplant a fellow chemist after definite steps have been taken toward the latter's employment.

13. He shall not knowingly accept employment by a client or employer while the claim for compensation or damage, or both, of a fellow chemist previously employed by the same client or employer and whose employment has been terminated, remains unsatisfied, or until such claim has been referred to arbitration or issue has been joined at law, or unless the chemist previously employed has neglected to press his claim legally.

14. He shall be diligent in exposing and opposing such errors and frauds as his special knowledge enables him to recognize.

15. Any infractions of these principles of professional conduct coming to his attention shall be reported to the Ethics Committee of the American Institute of Chemists.

16. He shall not attempt to compete with a fellow chemist on the basis of professional charges by reducing his usual charges in order to underbid after being informed of the charges named by the competitor.

17. He shall not accept any engagement to review the professional work (except journal articles and similar scientific publications and in litigation) of a fellow chemist without the knowledge of such chemist or unless the connection of such chemist with the work has been terminated.

18. When undertaking work for a client or employer, he should enter into an agreement regarding the ownership of any and all data, plans, improvements, patents, designs or other records which he may develop or discover while in the employ of such a client or employer. In the absence of a written understanding the following principles are held to apply:

(a) If a chemist uses information obtainable only from his client or employer which is not common knowledge or public property, any results in the form of designs, plans, inventions, processes, etc., shall be regarded as the property of the employer.

(b) If a chemist uses his own knowldge or infor-

mation or data which by prior publication or otherwise are public property, then the results in the form of designs, plans, inventions, processes, etc., remain the property of the chemist and the client or employer is entitled to their use only in the case for which the chemist was retained.

(c) All work and results accomplished by the chemist outside of the field for which he was employed or retained are the property of the chemist.

(d) Special data or information obtained by a chemist from his client or employer or which he creates as a result of such information, are to be considered, and while it is ethical to use such data or information in his practice as forming part of his professional experience, its publication without permission is improper.

19. He shall as far as possible in consulting work fix fees at a point high enough to warrant complete and adequate service. Unreasonably low charges for professional work tend toward inferior and unreliable work. In fixing fees it is proper for him to consider:

(a) The time and labor involved, the novelty and difficulty of the matter and the experience and skill necessary.

(b) Whether the employment precludes other employment in similar lines or will involve the loss of other business while engaging in the particular work.

ACID YELLOW AND OTHER NEW SHADES ON GENERAL DYESTUFF LIST

Attractive circulars containing swatches and dyeing directions of four colors recently placed on the market have been issued by General Dyestuff Corporation of New York.

Among the new shades is a yellow of greenish hue and brilliancy, designated by the name Brilliant Sulpho Flavine FF. This is a new acid dyestuff offered for the dyeing of wool and silk. The dyeings show a greenish fluorescence. Combined with Sulpho Rhodamine G and B, orange and scarlet shades of unusual brightness are obtained. According to the description of the new color, it dyes level and is also suitable for printing. It is said to be stable against Rongalite C and therefore well suited for discharge work. The circular on this shade contains eight swatches, both yarn and piece goods, displaying its use in dyeing and printing as a self shade and in combination.

Another new shade described in these circulars is Supranol Scarlet GX. This product, dyed from an acetic acid bath on wool, produces bright yellowish scarlets that are described as of very good fastness to washing and fulling, and good fastness to light. The announcement states that its fastness to water and salt is excellent. Supranol Scarlet GX, it is stated, is especially recommended for the dyeing of knitting yarn for sweaters, bathing suits, hosiery, etc.

Several brilliant swatches of cotton, rayon, unweighted silk yarn and bleached velveteen piece goods display the shade of a third new product, Diazo Fast Green GFL, on which the General Dyestuff Corporation has also issued a shade card. This dye is diazotized and developed with Developer Z and produces bright green shades which are described by the manufacturers as being of very good fastness to washing and remarkable fastness to light. With Rongalite C, according to the folder, a clear white discharge is obtained.

A new Indo Carbon brand is described in an announcement of Indo Carbon CLG Conc., which is said to possess the same fastness properties as the old Indo Carbon CL Conc. Its principal advantages over ordinary types of Sulphur Black, it is further stated, are its fastness to storing and to chlorine. The shade card displays three swatches, showing the color on water yarn, mercerized scrooped yarn and piece goods.

NEW DYEING PLANT OPENED BY H. & H.

Quidnick Dye Works Managed by Raymond Curtis

Modern dyeing and finishing equipment for handling rayon and silk fabrics has been installed in a plant recently opened in Quidnick, R. I., by the H. & H. Manufacturing Company, Inc. This will be known as the Quidnick Dye Works, Inc., and will be under the management of Raymond Curtis, who has been in charge of the silk dyehouse of the Bradford Dyeing Association at Bradford for two years.

Mr. Curtis is an English-trained dyer and university graduate. For a number of years he was on the technical staff of the British Dyestuffs Corporation, which is now a unit of the Imperial Chemical Industries, Ltd., and he was also manager for four years of the silk dye works of Brough, Nicholson & Hall, of Leek and London, England.

The new Quidnick dye works have been efficiently designed to take care of all classes of rayon and union fabrics as well as the particular output of the H. & H. Manufacturing Company.

The Fairmount Dye Works, Philadelphia, Pa., have taken out a permit for a new two-story brick dyehouse, 43 x 63 feet, on east side of Cedar Street, estimated to cost close to $50,000, with equipment. General contract recently was let to Wintz Bro., Inc., 1618 Sellers Street, Philadelphia. I. P. Orlick, 4634 Frankford Avenue, Philadelphia, is architect.

The Rock Hill (S. C.) Printing & Finishing Company is having the roof placed on the new plant, according to Brown-Harry Company, Gastonia, N. C., general contractors. The installation of machinery will begin about September 15, it was said. Robert & Co., Atlanta, Ga., and Lockwood Greene Engineers, Inc., Charlotte, N. C., are joint-engineers on the project.

Proceedings of the American Association of Textile Chemists and Colorists

The American Association of Textile Chemists and Colorists

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Harris, Robert H., suerintendent of dyeing, Spalding Knitting Mills, Griffin, Ga. Sponsors: D. C. Newman, Robert D. Sloan.

Jackson, T. H., second hand, Canada Mill, Canadian Cottons Street, Cromwall, Canada. Sponsors: George K. Hannah, Jr., and James O. Smith.

Meier, Gregor, chemist, Lyons Piece Dye Works, Fifth Avenue and Boulevard, Paterson, N. J. Sponsors: William H. Wingate and T. B. Schneider.

Morgan, James A., dyestuff salesman, John Campbell & Co., 99 Bedford Street, Boston, Mass. Sponsors: George C. Lommel and W. H. Zillessen.

Sheridan, Edward, boss color mixer, Apponaug Company, Apponaug, R. I. Sponsors: Eugene H. Aeckerle and James Green.

Siccama, Nicholas B., chemist, Lyons Piece Dye Works, Fifth Avenue, Paterson, N. J. Sponsors: William H. Wingate and T. B. Schneider.

Junior Membership

Campbell, Morris M., dye salesman, Carbic Color & Chemical Company, New York City. Sponsors: Chas. E. Mullin and J. E. Coplin.

A Chance for One of Our Members

A situation is open for a chemist who has had considerable experience with analytical work in connection with textile industries, preferably a man who has had considerable experience in textile industries in some capacity that required executive ability. This man should be able to go out into the mills and study problems from a consulting point of view and he should be of such caliber that he could take charge of that kind of work as well as inspire confidence in himself and his work.

To start the salary would be $75 or $100 a week.

If any of our members are interested they should write with full details as to their qualifications, care of the American Dyestuff Reporter, Box TC2.

Proceedings of the American Association of Textile Chemists and Colorists

Presentation of Fastness Tests for Cotton, Wool and Silk From Dye Manufacturers' and Distributors' Viewpoint

Introductory Statement

SEVERAL months ago Dr. R. E. Rose, of E. I. du Pont de Nemours & Co., forwarded for publication in the Proceedings a descriptive statement of the Fastness Tests for Cotton, Wool and Silks used in their Technical Laboratory. He pointed out the similarity of their methods to the Standard Methods formulated by the American Association of Textile Chemists and Colorists, and indicated all cases where these Standard Methods had been modified or other methods substituted.

It was suggested by various members of the Research Committee that it might be instructive to secure from other dyestuff manufacturers similar statements in regard to their methods and publish them simultaneously.

In order that this might be accomplished, a letter was sent to each dyestuff manufacturer mentioned in our list published on pages 110 and 111 of our 1928 Year Book.

Replies were received from approximately 40 per cent of these concerns, and many of them are printed in full or in part upon the following pages.

It is gratifying to find so many of the large dyestuff concerns following our Standard Methods, and we believe that the publication of these communications will lead to even more general use.

Since the publication of the 1928 Year Book, the Research Committee has been conducting experimental work with the object of correlating as far as possible their Standard Methods to the use of the Launderometer. As a result, certain changes will appear in the methods as published in the 1929 Year Book.

It is the intention of the Research Committee to revise their Standard Methods whenever it is shown that they can be improved or simplified without detracting from their value.

It is hoped that all interested members of the Association will carefully study the methods which follow, and submit any criticisms or suggestions which they believe will be of value to the Research Committee in the promotion of their work.

L. A. OLNEY.
Chairman, Research Committee.

Fastness Tests for Cotton, Silk and Wool

Submitted by Dr. R. E. Rose
E. I. du Pont de Nemours & Co., Wilmington, Del.

THE following are the methods for testing fastness, at present employed at the Technical Laboratory of E. I. du Pont de Nemours & Co., and used for comparative rating of properties of Du Pont colors and competing types.

The majority of these methods have been formulated by the research committees of the American Association of Textile Chemists and Colorists, and appear in the Association's Year Books. They are generally accepted as standard procedure, and have been in use for our tests since their official publication.

For complete details of standards and interesting notes we suggest a perusal of the A.A.T.C.C. 1928 Year Book.

For some tests for which the Association has not formulated methods, we are using those proposed by similar research committees of German or English chemists and technical organizations when available.

In all other cases we have developed procedures which we believe give results reasonably comparable with practical procedure. The latter will be replaced by A.A.T.C.C. methods when these are formulated.

The source of each method is designated in the boldfaced type in parentheses.

The official A.A.T.C.C. methods suggest the use of yarn for the tests. For convenience in filing our results we are using piece goods, 2 by 4 inch pieces of dyed material with 1 by 2 inch pieces of undyed material attached for the determination of the amount of staining. All of our tests, after drying in the air, are smoothed with an iron at 400° F.; this serves as an aid in the judgment of the tests.

The official A.A.T.C.C. methods for perspiration tests recommend that the tested material be dried in desiccators. This requires a period of 48 hours. As we have found this very inconvenient when conducting a large number of tests, we dry in the air at 70° to 80° F., which requires approximately four hours.

Proceedings of the American Association of Textile Chemists and Colorists

FASTNESS TESTS—COTTON

Acids

(A.A.T.C.C.)

Acetic—Make a solution composed of:

560 c.c. glacial acetic acid, and
440 c.c. distilled or Permutit water

1,000 c.c.

(Du Pont)

Sulphuric—Use a 10% solution of 66° Bé. sulphuric acid.

(A.A.T.C.C.)

Hydrochloric—Make a solution composed of:

100 c.c. concentrated hydrochloric acid (35%) and
900 c.c. distilled or Permutit water

1,000 c.c.

Spot or sprinkle with the solution of 70° F. a piece of the material to be tested. Allow to dry in the air. Rinse thoroughly in cold water until blue litmus paper does not show a change when firmly pressed against the well-wrung material.

Alkalies

(A.A.T.C.C.)

Ammonia—Immerse the material to be tested in cold 28% concentrated ammonia for two minutes. Dry in the air and smooth without rinsing.

(A.A.T.C.C.)

Soda Ash—Immerse the material to be tested in a cold 10% solution of soda ash for two minutes. Dry in the air and smooth without rinsing.

(Standard German and English Methods)

Modified Kier Boil—With bleached cotton only

1 3/10 c.c. caustic soda 31° Bé., or 52° Tw., or
a 25% solution are added to
100 c.c. distilled or Permutit water.

Enter the material to be tested and boil gently for six hours, adding water as necessary to replace that lost through evaporation. Rinse thoroughly in cold water, until Brilliant Yellow paper does not change when pressed firmly against the well-wrung material.

If 200 c.c. are required to make the test, double the quantity of caustic soda to 2.6 c.c.

Bleaching—With Unbleached Cotton Only

(A.A.T.C.C.)

Chlorine—Use sodium hypochlorite of the following strengths:

A—0.7% available chlorine
B—0.4% available chlorine
C—0.2% available chlorine

Use A and B for Ponsol, Sulfanthrene and Naphthanil colors, and C for all other cotton colors.

Saturate the material to be tested with the required strength solution. Squeeze out the surplus liquor slightly and place the material in a covered glass beaker for one hour at 70° to 75° F. Rinse well in running cold water for at least five minutes. Wring and enter into a cold 1% solution of sodium thiosulfate (hyposulfite) for ten minutes with occasional stirring.

Use 100 c.c. for each test. Rinse in cold running water for at least five minutes.

(Standard German and English Methods)

Hydrogen Peroxide—With unbleached cotton, wool and silk.

For each test use:

50 c.c. hydrogen peroxide (3% by volume) and
70 c.c. distilled or Permutit water.

Heat to 120° F. and just before entering the material add two drops of concentrated ammonia, or sufficient to turn Brilliant Yellow paper to a dark orange or light red.

Be careful to avoid an excess of ammonia.

Allow the material to lie for 12 hours in the cooling bath, keeping it under the surface of the liquor and the container covered during this period.

Rinse thoroughly first warm, and then cold.

Crocking and Rubbing

(A.A.T.C.C.)

The dyeing to be tested is rubbed with an unsized white cotton cloth. The cloth is placed over the index finger, and applying plenty of pressure the finger is passed ten times over a length of 4 inches on the dyed fabric. Another test should be made with a moist white cloth.

Cross-Dyeing

Onto a 2 g. piece of light-weight woolen cloth (nun's veiling), sew a two or three inch square of the dyed material.

Use a dye bath of 200 c.c. for each test.

For convenience figure the total weight of the material as 2½ g.

(Du Pont)

A—*Acetic Acid*—20% acetic acid (28%) on weight of material. Boil one hour, adding water to keep the volume constant.

(Du Pont)

B—*Sulphuric Acid*—3% sulphuric acid (66° Bé.) on weight of material; 20% Glauber salt on weight of material. Boil one hour, adding water to keep the volume constant.

(Du Pont)

C—*Top-chromed*—20% acetic acid (28%) on the weight of material.

Boil one hour, adding water to keep the volume constant.

Rinse thoroughly in water at 140° to 160° F. and enter into a fresh bath at 140° to 160° F. containing

Ten per cent acetic acid (28%) on weight of material and 2% sodium or potassium bichromate on weight of material.

Boil one hour, adding water to keep the volume constant.

Finish all tests with a thorough warm rinse, and dry.

Fulling—With Bleached Cotton, Wool and Pure Silk

(A.A.T.C.C.)

Use a solution containing per 1,000 c.c.

5 g. Lux or olive oil soap, and
2 g. soda ash.

Into 110 c.c. of this solution, at 80° F., place the material to be tested. Moisten thoroughly, so that it will remain below the surface of the liquor and allow to stand covered for 16 hours at room temperature (70° to 80° F.).

Heat to 140° F. and run in the fulling machine for 5 minutes.

Return to the solution for 10 minutes at 140° F.

Run 5 minutes in the fulling machine. Rinse thoroughly warm, then cold.

Hot Pressing—With Bleached Cotton, Wool and Pure Silk

(A.A.T.C.C.)

Moist—Thoroughly moisten the material to be tested with cold water. Wring and iron dry at 400° F. between white cotton cloths.

(A.A.T.C.C.)

Dry or Hot Calendering—Place a medium hot iron (400° F.) on a part of the material to be tested. Remove the iron and note the change, if any, and how soon the heated part returns to its original shade.

Mercerizing

(Du Pont)

Take equal size pieces of the material to be tested and white bleached cotton cloth. Attach both to a clean board firmly, slightly stretched, the white cotton on top.

Immerse for 5 minutes in a cold solution containing 25% by weight of caustic soda, which is equivalent to a 31° Bé. and 52° Tw. solution. Rinse for at least 5 minutes in running cold water.

Remove the materials from the board and enter into 100 c.c. of a cold ½% solution of acetic acid for 5 minutes.

Rinse thoroughly in cold running water for at least 5 minutes, or until neither blue nor red litmus paper shows a change when firmly pressed against the well-wrung materials.

Perspiration—With Bleached Cotton, Wool and Pure Silk

(A.A.T.C.C.)

Acid—Make a solution containing per 1,000 c.c.

10 g. common salt (sodium chloride)
1 g. lactic acid (U. S. P.)
1 g. sodium phosphate (mono-basic) (NaH_2PO_4)

(A.A.T.C.C.)

Alkaline—Make a solution containing per 1,000 c.c.

10 g. common salt (sodium chloride)
4 g. ammonium carbonate (U. S. P.)
1 g. sodium phosphate (di-basic) (Na_2HPO_4)

Saturate pieces of the material to be tested with these solutions. Remove excess liquor by a slight squeezing. Place in a test tube, and allow to remain overnight.

Dry in the air in the morning.

Steaming—With Bleached Cotton, Wool and Pure Silk

(Du Pont)

For 45 minutes, at 8 pounds' pressure, in the Cottage steamer, with ordinary dry steam. Not superheated.

Stoving—With Bleached Cotton, Wool and Pure Silk

(Du Pont)

Wet—Enter the material to be tested into 100 c.c. of 8° Bé. cold sodium bisulphite for 2 hours.

Rinse thoroughly in running cold water for at least 5 minutes.

Wring and enter into 100 c.c. of cold 2° Bé. sulphuric acid for 20 minutes.

Rinse thoroughly in cold running water until blue litmus paper does not show a change when firmly pressed against the well-wrung material.

(A.A.T.C.C.)

Dry—Thoroughly moisten the material to be tested with a ½% solution of Lux or olive oil soap. Squeeze slightly and enter into the sulphur fumes. Allow to remain for 12 hours in a sealed container, which will exclude access of air.

Rinse thoroughly warm, then cold, and dry.

Washing or Soaping—With Bleached Cotton, Wool and Pure Silk

(A.A.T.C.C.)

With Diazo, Naphthanil, Ponsol, Sulfanthrene and Sulfogene colors make a boiling and severe wash test.

With direct and aftertreated direct colors make a severe and moderate wash test.

	Temp.	Soap	Soda Ash	
Boiling test	212°F.	5 g.	2 g.	per 1,000 c.c.
Severe test	160°F.	1 g.	1 g.	per 1,000 c.c.
Moderate test ...	120°F.	1 g.	0 g.	per 1,000 c.c.

Immerse the material to be tested in 100 c.c. of the solution at the proper temperature for ½ hour.

Rinse thoroughly the boiling and moderate tests at 100° to 120° F. and iron dry.

Rinse the severe test thoroughly at 100° to 120° F. and immerse at 100° F. for 10 minutes in 100 c.c. of a solution made as follows:

1 c.c. ordinary 10% solution acetic acid
99 c.c. distilled or Permutit water

100 c.c.

Rinse thoroughly cold.

Power Laundry Washing

(Nafal Label Test)

These tests are made in the Launderometer. For description and details see A.A.T.C.C. 1928 Year Book, page 66, and Technical Bulletin, Volume 8, No. 12, page 290.

For these tests standard solutions as follows are used:

1. 5 g. 88% tallow soap and 2 g. soda ash (58% sodium oxide) per 1,000 c.c.

2. A solution containing 1% of available chlorine.

3. A solution containing ½ g. acetic acid (56%) per 1,000 c.c.

To a 4 by 2½ inch piece of dyed material (10 sq. in.) sew to one end an equal-sized piece of bleached cotton (80 square, four yard per pound sheeting).

A. Into 100 c.c. soap solution at 160° F. place the material and run in the machine for 20 minutes at 160° F. Drain

B. and add to jar quickly 100 c.c. soap solution at 160° F. and 1 c.c. chlorine solution. Run 12 minutes at 160° F. Drain

C. and add to jar 200 c.c. cold water at 160° F. Run 12 minutes at 160° F. Drain

D. and add to jar 200 c.c. cold (70 to 80° F.) acetic acid solution.

Shake jar and allow to stand for 12 minutes cold. Drain

E. and add to jar 200 c.c. cold water. Rotate jar slightly by hand and allow to stand 10 minutes.

F. Remove material, extract moisture by passage through a wringer or whiz and then iron dry immediately at 400° F.

For materials dyed with colors which will not withstand the chlorine, conduct the test as above, but eliminate the chlorine from the second or B operation.

Materials bearing the NAFAL labels are submitted to this test and to be satisfactory must not stain the white or change the shade or depth of the dyeing to more than a negligible extent.

Water—With Bleached Cotton, Wool and Pure Silk

(A.A.T.C.C.)

Cold—Moisten thoroughly with cold water (70° F.), place in a test tube, insert a cork stopper and allow to remain overnight. Iron dry without rinsing.

(A.A.T.C.C.)

Salt—Use a solution containing per 1,000 c.c. 30 g. common salt (sodium chloride) 5 g. magnesium chloride.

Moisten thoroughly with this solution at 70° F. Place in a test tube; insert a cork stopper and allow to remain overnight. Iron dry without rinsing.

Boiling Water or Neutral Crabbing

(Du Pont)

Boil for 2 hours in 250 c.c. of distilled or Permutit water, keeping the volume constant by the necessary additions of water to replace that lost through evaporation.

Iron dry at 400° F. between cotton cloths.

Spotting Tests

(Du Pont)

Spot or sprinkle the material to be tested with

A. Cold distilled or Permutit water, and

B. The solution of salt water, made as mentioned above.

Dry in the air and iron with a medium hot iron.

FASTNESS TESTS—WOOL

Acids

(A.A.T.C.C.)

No tests are necessary as practically all wool dyed with synthetic colors is fast to dilute acids except as in acid milling and carbonizing, tests for which are referred to later.

Acid Boil or Acid Crabbing—With White Cotton, Wool or Silk

(Du Pont)

Boil for one hour with 200 c.c. of solution containing

2½% sulphuric acid and

5% Glauber salt both on the weight of the material.

Rinse thoroughly warm, then cold, and dry.

Alkalies

(A.A.T.C.C.)

Ammonia—In a clean dry bottle of approximately 1,000 c.c. capacity, place 2½ c.c. of concentrated am-

monia (28%). Suspend the material to be tested by a cord or other suitable means, in such manner that it will not be closer than 1 inch to the ammonia. Cover with a cork stopper and allow to remain for 24 hours. Remove from the container and allow to hang in the air for 2 hours.

(A.A.T.C.C.)

Soda Ash—With white cotton, wool and silk.

Immerse the material to be tested in a 10% cold solution of soda ash for 2 minutes. Wring and without rinsing, dry in the air.

(A.A.T.C.C.)

Street Dirt—Make a smooth paste of 1 g. of calcium hydroxide and 2 c.c. of cold distilled or Permutit water. Spot with this freshly prepared calcium hydroxide paste. Allow to dry in the air and remove with a brush.

Bleaching—All Three Tests With White Cotton*, Wool and Silk

(Standard German and English Methods)

Hydrogen Peroxide—Conduct this test the same as given for cotton.

Stoving

(A.A.T.C.C.)

Dry—Moisten the material to be tested with a 5% solution of Lux or olive oil soap. Wring and enter into the sulphur fumes and allow to remain for 12 hours. Rinse thoroughly with cold water and dry.

(Du Pont)

Immerse the material to be tested in a cold 8° Bé. solution of sodium bisulphite for 2 hours. Rinse thoroughly in cold water and immerse in a cold 2° Bé. solution of sulphuric acid for 20 minutes. Rinse thoroughly cold until all traces of acid have been removed.

Carbonizing—With White Cotton

(A.A.T.C.C.)

Acid—A portion of the sample dyeing is saturated with sulphuric acid at 6 to 8° Tw.; remove the excess of acid by squeezing or whizzing, dry at 160° to 180° F. in the absence of strong light and bake at 212° to 225° F., rinse as nearly neutral as possible with water; dry.

(A.A.T.C.C.)

Aluminum Chloride—Saturate the sample dyeing with aluminum trichloride, 8° to 10° Tw., squeeze or extract; dry at 230° to 250° F.; rinse and dry.

In either case it is best not to neutralize, as it is very difficult to do so without producing an alkaline reaction which may alter the shade of some dyes, either in this process or during a succeeding treatment.

*Use unbleached cotton for all bleaching tests and bleached cotton for all other tests.

Crocking or Rubbing

(A.A.T.C.C.)

Same as for cotton and silk.

Discharge

(The necessary discharge tests will be made by the printing department.)

Fulling—With White Cotton, Wool and Silk

(A.A.T.C.C.)

Make a solution containing per 1,000 c.c.

5 g. Lux or olive oil soap, and
2 g. soda ash.

In 150 c.c. of this solution immerse the material to be tested for 16 hours at room temperatures (70° to 80° F.).

Keep the material under the liquor and the container covered during this period. Heat in a water bath to 140° F. Remove from the bath and mill briskly on a scrubbing board until the wool is thoroughly felted. Rinse thoroughly with warm water and dry in the air.

Hot Pressing—With White Cotton, Wool and Silk

(A.A.T.C.C.)

Moist—Same as for cotton and silk.

(A.A.T.C.C.)

Dry—Same as for cotton.

Level Dyeing

(Standard German Method)

For acid colors.

A. On a 2½ g. piece of woolen broadcloth make a 1% dyeing of the color to be tested, by the usual standard method using 200 c.c. of dye liquor. Then add into the same bath another piece of woolen broadcloth of 2½ g. and boil both together for three-quarter hour. Rinse well and dry.

B. On a 5 g. piece of woolen broadcloth make a ½% dyeing of a known level dyeing contrasting acid color by the usual standard method. Then add into the same dye bath ½% of the color to be tested and boil for three-quarter hour. Rinse and dry.

Level Dyeing Acid Colors to Be Used as Standards

Pontacyl Light Yellow 3G to be used for violet, blue, green and black.

Pontacyl Brilliant Blue A to be used for yellow, orange, brown and red.

For Top Chrome, Mono-chrome and Bottom Chrome Colors

Make a dyeing on a 10 g. piece of woolen broadcloth in 500 c.c. dye liquor, by the usual standard methods,

and observe the rate and extent of the exhaustion of the dye bath.

PENETRATION—FOR ACID COLORS ONLY

(German)

Dye a 5 g. piece of thick bleached woolen felt in 250 c.c. dye liquor containing:

20% Glauber salt. Boil for ¾ hour and add
1% color to be tested. Boil ¾ hour and add
3% sulphuric acid and boil ¾ hour.

PERSPIRATION—WITH WHITE COTTON, WOOL AND SILK

Make both the acid and alkaline tests as given for cotton and silk.

SPOTTING

(Du Pont)

Spot or sprinkle the material to be tested with:

A. Cold distilled or Permutit water, and
B. Salt water solution as given for cotton spot tests.

Dry in the air.

STEAMING—WITH WHITE COTTON, WOOL AND SILK

(Du Pont)

For 45 minutes in the Cottage steamer with 8 pounds' pressure.

A. With moist steam and
B. With superheated steam.

WASHING OR SOAPING—WITH WHITE COTTON, WOOL AND SILK

(A.A.T.C.C.)

Make a solution containing per 1,000 c.c., 5 g. of Lux or olive oil soap.

Into 200 c.c. of this solution at 120° F. enter the material to be tested and wet thoroughly. Pass through the wringer to assist thorough moistening, saving the removed liquor.

A. Treat in this solution for ½ hour at 120° F. with occasional stirring and

B. Treat in the solution for 4 hours at 120° F. with occasional stirring, keeping the material under the surface of the solution during the entire period.

Remove and rinse thoroughly warm, then cold, and dry.

C. Hot soaping test. With white cotton, wool and silk.

Immerse for one hour at 200° F. in a covered glass beaker containing 125 c.c. of a 10% solution of Lux or olive oil soap, stirring occasionally. Rinse thoroughly warm, then cold, and dry.

WATER TESTS—WITH WHITE COTTON, WOOL AND SILK

(A.A.T.C.C.)

Cold—Wet thoroughly with cold distilled or Permutit water. Wring. Place in a test tube; insert a cork stopper and allow to remain overnight. Iron dry between cotton cloths.

(A.A.T.C.C.)

Salt—Use a solution containing per 1,000 c.c.:

30 g. common salt, and
5 g. magnesium chloride.

Treat exactly as for the cold water test.

(German)

Boiling Water—Neutral crabbing or potting test.

Immerse for 2 hours at 200° F. in 250 c.c. of distilled or Permutit water, keeping the volume constant by additions of water when necessary.

FASTNESS TESTS—SILK

BLEACHING

(German)

Use 2 by 6 inch pieces of dyed and raw silk in the gum, sewn together on both 2-inch ends.

Submit to the boil-off test, rinse and treat exactly as described for the hydrogen peroxide test for cotton.

BOIL-OFF

(A.A.T.C.C.)

Use 2 by 6 inch pieces of dyed and raw silk in the gum, sewn together on both 2-inch ends.

Treat for 2 hours at a gentle boil in 100 c.c. of a ½% solution of olive oil soap, keeping the volume constant by additions of water to replace that lost through evaporation.

Rinse in cold water, pass through the wringer several times between paper towels and dry in the air.

(A.A.T.C.C.)

Crocking—Make the test exactly as described for cotton.

Cross-Dyeing—Sew a 2 by 5 inch piece of the dyed silk to be tested onto a 2 g. piece of woolen nun's veiling.

(Du Pont)

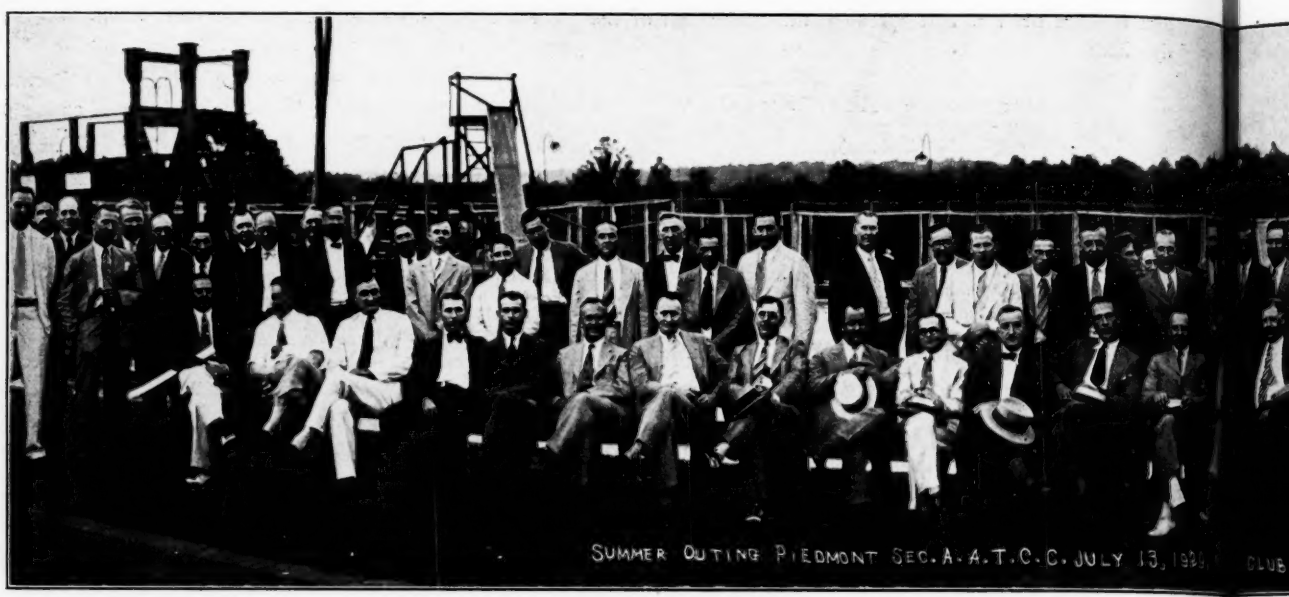
Acid—Make the test in 100 c.c. liquor with 20% acetic acid on the weight of the wool.

Boil for one hour gently, adding water to replace that lost through evaporation.

Rinse thoroughly warm and cold; dry in the air.

(Du Pont)

Afterchromed—Make the test in 100 c.c. liquor with 20% acetic acid on the weight of the wool.



Boil one hour gently, rinse thoroughly warm and treat in a fresh bath containing on the weight of the material (wool):

10% acetic acid and
2% sodium or potassium bichromate.

Boil one hour gently. Rinse thoroughly warm, then cold.

Dry in the air.

Keep the baths constant during the treatments by additions of the necessary water to replace that lost through evaporation.

FULLING—WITH BLEACHED COTTON, SILK AND WOOL

(A.A.T.C.C.)

Make this test exactly as described for wool.

PRESSING MOIST AND DRY

(A.A.T.C.C.)

Make these tests exactly as described for cotton.

PERSPIRATION—ACID AND ALKALINE

(A.A.T.C.C.)

Make these tests exactly as described for cotton.

SCROOPING

(Du Pont)

Immerse for 5 minutes in a cold solution containing:
5 g. per 1,000 c.c. of tartaric acid.
Dry in the air without rinsing.

SOAPING-WASHING-LAUNDERING—WITH BLEACHED COTTON, SILK AND WOOL

(A.A.T.C.C.)

Use 100 c.c. ½% solution of Lux or olive oil soap for each test and immerse for 10 minutes at 120°, 140°, 160° or 200° F. as required.

Rinse in cold water, pass through wringer several times between paper towels and dry in the air.

STEAMING—WITH BLEACHED COTTON, SILK AND WOOL

(Du Pont)

For 45 minutes at 8 pounds' pressure with dry steam in the Cottage steamer.

SPOTTING

(Du Pont)

Sprinkle or spot the material to be tested with:
A. Cold water and
B. Salt water solution (same as used for the salt water tests).

Dry in the air.

WATER TESTS—WITH BLEACHED COTTON, SILK AND WOOL

(A.A.T.C.C.)

Cold, salt and boiling.

Make these tests exactly as described for cotton.

For all tests made on dyed pure silk, use white degummed pure silk, and for all tests made on dyed weighted silk use white weighted silk.

FASTNESS TESTS—RAYON

Make all the necessary fastness tests exactly as described for silk, unless the dyed rayon is to be used in combination with cotton or wool when the methods for the latter materials are to be used.

Submitted by Newport Chemical Works, Inc.

Passaic, N. J.

THE question of a standardization of fastness tests for dyed materials has been the subject of considerable thought and research by various sub-committees appointed for the purpose by the Research Committee of the American Association of Textile Chemists and Colorists. To what extent their recommendations have been adopted in the laboratories of the Newport Chemical Works, Inc., will probably be of interest to the Research Committee.

In the majority of cases, the laboratory of the Newport Chemical Works has adopted these tests, in some instances with slight modifications or additions, and in a few cases we also have tests on which as yet no report has been made by any of the sub-committees. Listed below are the various tests which we make, together with notes to indicate where the Association tests have been adopted, as well as modifications or additional tests.

No. 1—Fastness to Washing

The Association tests have been adopted. We also make an additional test on fabrics dyed and printed with vat colors. This test embodies a treatment with chlorine, as well as soap and soda ash and is primarily intended to exercise a control on goods washed by laundries who do not adhere strictly to the methods of laundering sponsored by the Laundryowners' National Association.

No. 2—Fastness to Chlorine Bleaching

The Association tests have been adopted. We also use the following additional test: Immerse the dyed fabric in sufficient chloride of lime solution of 2° Tw., 5.58 grams available chlorine per liter, to completely cover. Allow to stand 20 minutes at room temperature, remove, rinse in cold water, anti-chlor in a weak solution of sodium bisulphite, rinse thoroughly and dry. The change of shade is then noted. We find that this gives a satisfactory quick comparison between two or more samples for laboratory use.

No. 3—Fastness to Acids and Alkalies

The Association tests have been adopted. In addition we also test for fastness to a 1 to 10 caustic soda solution, usually by spotting this solution on the dyed goods.

No. 4—Fastness to Crocking

The Association tests have been adopted.

No. 5—Fastness to Sea Water

The Association tests have been adopted. In addition, we spot the goods with a 10% sodium chloride solution and allow this to dry in the air for 30 minutes. The change of shade is then noted.

No. 6—Fastness to Carbonizing

The Association tests have been adopted.

No. 7—Fastness to Stoving

The association tests have been adopted. For a quicker comparison we also make 4-hour test instead of the 12-hour test called for by the Association tests.

No. 8—Hot Pressing

The Association tests have been adopted.

No. 9—Perspiration

We do not use the Association tests. Our tests are as follows: A. Acid Perspiration—The dyed material is braided with an equal quantity of white cotton, wool and silk and immersed in a solution containing 50 grams sodium chloride, 5 grams acetic acid per liter. The temperature at immersion is 105° F. and the solution is allowed to stand cooling for 1 hour. The swatch is then removed, dried without rinsing, and stain of adjacent fibers and change in shade is noted.

B. Alkaline Perspiration—A similar swatch is immersed in a solution containing 50 grams sodium chloride and 1 gram 20% ammonia per liter. The swatch is immersed at 105° F. and allowed to stand cooling for 1 hour. It is then removed, dried without rinsing, and observations made as in acid perspiration. We find that this gives a quick method and satisfactory comparative results. We usually specify the degree of fastness to both acid and alkaline perspiration and do not regard the color as fastness unless it answers both tests.

No. 10—Steaming

A piece of dyed goods, 3 inches long and one inch wide, is rolled tightly in bleached cotton which has previously been desized. The cloth in which the sample is rolled is a light percale. The sample is then put into a steamer made from a piece of 12-inch cast iron pipe with a loose cover. The steam is turned on the steamer for about 10 minutes before the sample is entered. We make three steaming tests:

A. For 3 minutes in free steam.

B. For 5 minutes in free steam.

C. For 5 minutes in steam under 12-pound pressure. The degree of marking off on the white and change in shade is noted, after each of these tests and statements of fastness made accordingly.

No. 11—Cross Dyeing

A. *For Wool*—A 2-gram piece of the dyed wool is braided with white cotton, wool and silk boiled for 30 minutes in 50 c.c. water containing 2 c.c. of 1 to 10 sodium chloride solution. It is then removed, rinsed lightly and the degree of staining and change in shade is noted.

B. *For Cotton*—A 2-gram piece of the dyed cotton fabric is braided with white cotton, wool and silk and boiled 30 minutes in 50 c.c water containing 2 c.c. of 1 to 10 Glauber salt solution and 6 to 10 c.c. of 1 to 10 sulphuric acid. It is then removed, rinsed lightly and the change in shade and staining of adjacent fibers noted.

No. 12—Fulling

We use the laboratory fulling test recommended by the Association, with the exception that we do not soak the goods for 16 hours before fulling and also that we full with the hands and not on a board. It will perhaps be of interest at this point to state that we are making some tests to try to arrive at a satisfactory method of conducting a laboratory fulling test. These tests are being undertaken with the idea of standardizing and simplifying the mechanical part of the operation, which, after all, is the most difficult to duplicate in a laboratory test. If the experiments prove successful, there will be another communication on this subject at a later date.

No. 13—Discharge

For discharge tests on direct colors we use the following method: 35 parts of British gum are cooked to a smooth paste with 45 parts of water, cooled, and 20 parts of Formopon added and dissolved and the paste strained. This paste is then printed on the dyed goods, dried, steamed for 5 minutes in free steam, washed in cold water and dried. In special cases, such as discharges on tin weighted silk, it is advisable to slightly modify the above test by introducing about 10 parts per 100 of zinc oxide in the discharge paste. Otherwise, the test remains the same.

No. 14—Influence of Metals

This refers to acid, direct and vat colors. Dyeings are made in the regular manner for the class of color being tested and the influence of metals, iron, copper and Monel, observed in the shade change from a dyeing made in the regular way in a glass beaker. For iron, we put three 3-inch finishing nails in the beaker, for copper, 1 disc 2 inches in diameter and about 1/8-inch thick and for Monel metal, 1 disc Monel metal 2 inches in diameter and 1/8-inch thick.

Submitted by Zinsser & Co.

Hastings-on-Hudson, N. Y.

TESTS AS APPLIED TO WOOL

Fastness to Washing or Laundering

One-half per cent soap solution. Wet carefully the material to be tested. Remove and pass through wringer. Return to solution. Keep in solution for the time given for the test at a temperature of 120° F. Remove, wring. Pass through soap, wring. Rinse very carefully, wring and dry.

Class 1. Loss should be inperceptible or nearly so.

Examples are Ch. Azurol, Aliz. Blue Black B, Anth. Brown SW.

Note—Staining.

Fastness to Washing—Scouring

(*Standard*)—Dyed woolen material of almost any character should be capable of standing a more or less severe scouring. Material dyed as loose stock must afterward stand a rather severe scouring, in order to remove the oils added for purpose of spinning; yarn dyed material also accumulates grease and dirt in handling and weaving and must be scoured.

Goods dyed in the piece are usually scoured before dyeing; hence colors in this case need not be especially fast to scouring.

Test.—Braid with white wool and cotton and silk. Scour in ½% soap solution for 10 minutes—temperature 140° F. Squeeze, wash off in fresh water and dry.

Note—If dye tints soap solution, or if it tints the white it is not fast. Does not tint soap liquor or stain the white—FAST.

Fastness to Milling or Fulling

Refers to the process whereby woolen cloth is felted more or less in order to make a denser fabric or to otherwise finish the goods.

The felting is carried out in fulling mills or stocks, in which the material is saturated usually with an alkaline soap liquor, and then rubbed and squeezed together until the desired degree of felting is obtained.

Test.—Make a loose plait—dyed yarn—white cotton, wool and *silk*. Treat with a solution containing 10 grams of soap and 2 grams of soda ash per liter at 140° F. Soap the sample in this solution and rub between two pieces of board until the wool yarns are well felted together. Then wash in fresh water and dry. Note if the color has lost in intensity or if it has bled into the white wool, cotton or silk. In such case the dye cannot be considered fast to fulling.

Use as standard test American Association of Textile Chemists and Colorists Year Book method, page 72, 1925.

Take 2½ grams of the dyed yarn and braid it with smaller amounts of white wool, cotton and silk in such a way that the dyed wool comes in contact with the three undyed fibers. The weight of the dyed wool must be at least equal to the combined weight of the undyed material.

5 grams of neutral soap
2 grams of soda ash
1,000 c.c. distilled water.

Soak the braided sample in 150 c.c. of the above solution for 16 hours, at room temperature. Then heat to 140° F. Remove from the bath and mill briskly on a scrubbing board until the wool is thoroughly felted. Rinse, dry and unravel for examination. The above test compares with a 2-hour mill fulling.

Fastness to Alkali, Mud, Street Dirt

Dust and dirt from street which are of alkaline reaction. Soap washing hydrolyzes to form a strong alkali. Action of the soap in removing the dirt and also the alkali reaction of the soap solution. To remove fatty matters from woolen goods a washing with dilute soda ash solution is frequently given.

1. Test is made in the following manner: The sample to be tested is placed in a 10% solution of Na_2CO_3, which has been mixed with half the amount of a solution of sal ammoniac. The sample is allowed to remain in this solution for 15 minutes and then the excess alkali is squeezed out and the sample allowed to dry without first being washed. To be fast to alkali, there must not be any change in the color as a result of this treatment.

II. A sample of dyed yarn is plaited with white wool, cotton and silk, and steeped for one hour in a solution of soda ash of 3° Tw. at 120° F., then washed in fresh water and dried. (2.1° Bé. or 1.015 sp. gr.) (½% sol). Classify as not fast; fairly fast or fast.

Fastness to Lime or Street Dust

Spot sample of dyed yarn with a solution containing 20 grams quick lime and 10 c.c. ammonia per liter. Allow to dry and then brush off.

Fastness to Rubbing or Crocking

Refers to the degree of ease or of difficulty with which the color can be removed from the dyed fabric by simply rubbing it with a white cloth or piece of paper.

Test.—A piece of white cloth is rubbed over the surface of the dyed fabric, twelve times up and down.

Fastness to Potting, Steaming or Decatizing—Crabbing

In various finishing operations, dyed woolen fabrics may be subjected to a steaming operation in order to give the surface of the goods a luster and a certain finish.

The same operation is carried out in goods composed of wool and cotton yarns in order to prevent crinkling, in which case it is called "crabbing."

Test.—Prepare a braided sample containing the dyed yarn together with white wool and cotton. Steam the sample for one-half hour under about 5 pounds' pressure Note if the color suffers any alterations, or if it stains the white yarns.

Potting.—Boil for one hour in distilled water. Braid.

Crabbing.—Crabbing means passing the cloth through a trough of hot water and between weighted rolls to

take the kinks out and make a smoother and nicer piece of cloth.

Fastness to Ironing and Hot Pressing

Woolen material employed in the manufacture of suitings, etc., requires to be hot pressed or ironed.

Test.—A. Moisten a sample of dyed yarn or cloth and press with a hot iron till dry. Note any change after cooling.

B. Moisten a sample of dyed yarn or cloth and cover with a piece of white muslin, then press with a hot iron till dry and note any change. Note if color suffers any alteration or if it stains the white muslin.

If no change—class under A as fast. If it changes under (A) and not under (B) or if it stains the white slightly, class as fairly fast. If the color is altered by both class as *not* fast.

Fastness to Water

Fastness to water is required on dyed garment materials liable to get wet by rain. Colored yarns intended for fancy weaving must not bleed when sized, as the other yarns may stain. Colored woolen material must not bleed in steaming when drops of hot water fall.

In water fulling (or in potting) bleeding may be prevented by slightly acidulating the water.

Test.—Plait together strands of dyed yarn with white wool, cotton and silk. Steep this sample overnight. Note if the color has bled into the white yarn or into the steeping water. (Distilled.) A test sometimes lasts seven days.

If the dye does not bleed at all in boiling water it may be classed as fast.

If it bleeds slightly in boiling water and not at all in cold water it is fairly fast.

If it bleeds in the cold water test it is *not* fast.

Salt Water Test

Braid colored yarn with white wool, cotton and silk.

Immerse for 24 hours in a cold bath, forty times its bulk, composed of:

30 grams salt
6 grams calcium chloride
964 grams distilled water.

and then dry without rinsing.

I. Color of dyed wool changed only slightly; white wool becomes strongly colored. Not fast.

II. Color of white wool not changed; white wool becomes considerably changed. Fairly fast.

III. No change in colored wool and white wool. Fast.

Fastness to Perspiration

This is required of all dyed clothing material that is worn next to the skin; also for material for making horse blankets, etc.

A good practical test is to put the sample under the saddle cloth of a horse.

Laboratory Test.—Braid together with dyed yarn, white wool, cotton and silk. Immerse for one hour in a solution of lactic acid 4° Tw. at 100° F. or (2.7° Bé.) sp. gr. 1,020.

Carbonizing—Acids

To decompose any particle of vegetable matter which may be present.

Test.—Immerse sample of the dyed yarn in a solution of H_2SO_4° Tw. at 175° F. for half an hour, squeeze and without washing dry in a hot air flue. Then wash out and neutralize the acid with a 1% soda ash solution. Finally rinse well and dry.

Sometimes, in carbonizing, the dyed color may undergo an alteration in tone due to the action of the acid, but the original color is restored when properly neutralized with soda.

Fastness to Acids

I. Dyed wool is braided with equal quantity of washed white wool and immersed for 1½ hours in a bath seventy times its bulk at 90° to 92° C. The bath contains 2½ grams tartar in each liter of distilled water; the fabric is then rinsed and dried.

Color of dyed wool slightly changed; white wool colored—not fast.

Color of dyed wool not changed; white wool only slightly colored—fairly fast.

Color of dyed wool not changed; white wool not affected—fast.

1 gram—400). 92° C.

II. Dip into solution of Hcl—10% solution and dry. Note change.

Cross-Dyeing

Braid and boil in a bath containing 4% sulphuric acid and 10% Glauber salt.

Note stain on any of the other fibers.

Weather Test

By this is meant fastness to the varying conditions of exposure to the atmosphere such as alternate wetting by rain or dew and drying by heat of the sun, etc.

The best and most practical method of applying this test is to expose a sample of the dyed material to the action of the weather for two weeks or more.

Fastness to Stoving—Sulphuring

In some cases dyed wool is woven together with white and the cloth subsequently bleached by the action of sulphurous acid gas.

Test—Take a small sample of dyed yarn, moisten it with water and hang it for six hours in a closed bottle filled with sulphurous gas (obtained by burning a piece of sulphur in the bottle).

Note any change in color.

BLEACHING TEST FOR COLORED WOOL

A piece of dyed wool cloth is basted with white cotton, wool and silk threads and bleached in a bath consisting of:

100 parts distilled water
20 parts peroxide of hydrogen and a small quantity of ammonia.

This bath is forty times the bulk of cloth. Temperature 45° to 50° C.

The immersion lasts 12 hours. It is permitted to cool off gradually, and the cloth must remain submerged and must not be agitated too much.

Much be kept alkalin and tested with Congo paper.

Color of dyed wool not faded, not affecting wool threads—Fast.

Color of dyed wool becomes faded, not affecting wool threads—Fairly fast.

Color of dyed wool becomes faded, wool threads stained—Not fast.

LEVEL DYEING

Tests should be made on light shades, as self shade and in combination with a known level and penetrating color.

PENETRATION

Tests to be made on heavy cloth as a self color and in combination with a known level and penetrating color.

SENSITIVITY TO

Chrome—Use various amounts of chrome.
Iron—Dye with two small iron nails.
Copper—Dye in a polished copper beaker.

Submitted by National Aniline & Chemical Co.

New York

We now use all of the tests suggested by the American Association of Textile Chemists and Colorists.

It is our opinion that it would not be of any special value to the Association to publish certain specific tests that we might make in special cases as such tests do not apply generally.

Submitted by Calco Chemical Works

Bound Brook, N. J.

Owing to the various differences in methods of testing employed in years past by those interested in work of such a nature we were pleased when the American Association of Textile Chemists and Colorists offered to the trade standard methods for consideration and adoption. From the first we have adopted the Association's tests and look forward to the completion of the work being carried on so that we can have the complete set of Association tests as our standards.

From time to time we are called upon to use our customers' tests and this practice will very likely continue to a limited extent.

Submitted by Industrial Dyestuff Co.

East Providence, R. I.

We beg to advise that we use the methods recommended in your Year Book of the American Association of Textile Chemists and Colorists.

Submitted by New York Color & Chemical Co.

Belleville, N. J.

We find that we would have nothing new to suggest in this line as our methods are very similar to the Association's methods.

Submitted by John Campbell & Co.

New York

We are following the methods described in the Year Book of the American Association of Textile Chemists and Colorists. We do not have a standard set of property tests but apply individual tests for each individual dyestuff that we manufacture. Then again, in making our washing and light fastness test, we are more or less governed by our customers' requirements.

Submitted by Beaver Chemical Corp.

Damascus, Va.

We wish to advise that we use the methods as set forth in the Year Book of the American Association of Textile Chemists and Colorists without variation. We realize that it is important to get some standardized methods and have considered that these methods as described in the Year Book are about as standard as any we can get.

Submitted by American Aniline Products, Inc.

New York

It is customary for us to use the usual methods of the Association in most of our tests, the exception being our test for fastness to perspiration.

The following is the test which we use:

A braid about 10 inches long is made with three other fibers than the one being tested. If wool, we

braid with white wool, white silk, white cotton, etc.

Solutions are used as suggested by Association for fastness to perspiration in silk 50 c.c. each solution, acid and alkaline is put in 4-ounce bottles standing side by side and one end of the braid is put in each solution for 12 hours, then squeezed and wrapped in dry cloth for 4 hours and then dried.

The important change to us is in the fact that we have one braid having the alkaline reaction on one end and the acid reaction on the other.

We hope that this will be of some service to you.

Submitted by Garfield Aniline Works

Garfield, N. J.

We beg to inform you that the methods of dye testing in use in our laboratories are substantially the same as those recommended by the American Association of Textile Chemists and Colorists.

Submitted by Somerset Aniline Works

Pluckemin, N. J.

We wish to state that we have adopted the methods for fastness properties as published by the American Association of Textile Chemists and Colorists. We have discarded our own methods in the belief that more satisfactory results are obtained if the procedure is the same everywhere.

SUMMER OUTING OF THE PIEDMONT SECTION

THE regular summer outing and meeting of the Piedmont Section was held at Myers Park, Charlotte, N. C., Saturday afternoon and evening, July 13.

Following a light lunch at noon, the afternoon was given over to sports, and was very thoroughly enjoyed by the 130 present. Very suitable prizes were donated to the winners of the various events, which included baseball, quoits, golf, and swimming.

At 7:30 a very enjoyable dinner was served by the management of the Myers Park Club, after which Dr. E. H. Killheffer, president of the Association, and Warren B. Lewis, of Providence, R. I., addressed the gathering. Dancing followed.

John L. Crist, vice-chairman of the Section, presided in a most creditable manner as toastmaster of the banquet.

At a short business meeting the following committees were elected:

Nominating Committee: J. D. Sandridge, chairman, Paul Haddock, Thomas Johnson. Membership Committee: R. M. Mitchell, Dyer Moss, Malcolm Mackenzie, chairman, Edgar White, John Cosby.

The party broke up at a late hour, greatly pleased with the festivities of the day.

Dr. Killheffer's paper is given herewith. Mr. Lewis' paper will appear in full in an early issue.

T. J. NUCKOLLS, *Secretary.*

Dyes and the Tariff as Related to the Textile Industry of the United States*

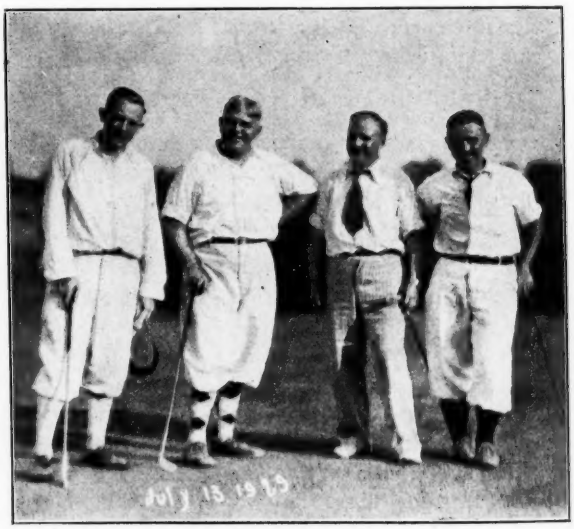
By DR. E. H. KILLHEFFER

President of the A. A. T. C. C.

THIS is a rather imposing title, and I realize that without deviating far from the subject a talk of several hours' duration could easily be made. It will be my effort therefore to briefly refer to some of the high spots involved, which I believe you will all find interesting. There is so much said and written at the present time in connection with the tariff that is wholly or partially erroneous that I think it is wise for us occasionally to take account of the true situation in its direct bearing upon us and our several industries.

Following the Great War practically every industrial nation recognized in some way the importance of the synthetic organic chemical industry and the place it occupied in their national welfare. This recognition was in the form of protective measures of various sorts designed to insure the building up as well

*Paper delivered at the summer meeting of the Piedmont Section, Charlotte, N. C., July 13.



J. L. Crist (Vice-Chairman, Piedmont Section), Dr. E. H. Killheffer, Dyer S. Moss (Past Secretary, Piedmont Section), and W. S. Marnock (of Lyman, S. C.) Pause Over Their Tee at the Piedmont Section Outing.

as the permanence of these industries in the respective countries. These measures included subsidy, embargo, high tariffs, the latter method being adopted in a modified degree in the United States.

Now, this tariff on dyes as embodied in the last Tariff Act of 1922 did not provide so exorbitantly high ad valorem and specific duties as would have been required to actually build up an industry here if the

After the Races
At the Outing of the Piedmont Section.

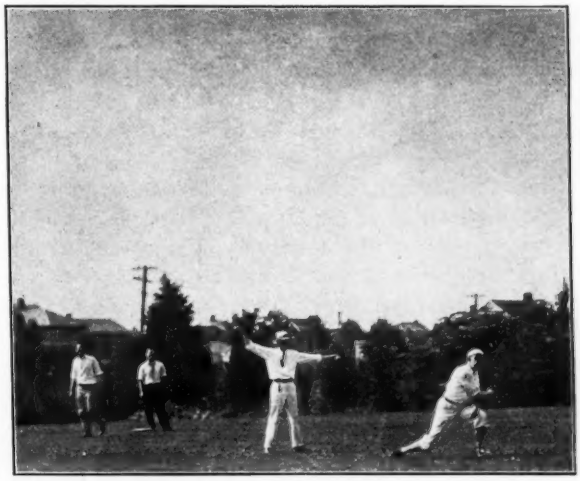
duties were still to be assessed on the foreign valuations as they were before the war. Instead of this these products were made dutiable either on American selling price or on the basis of United States value, or in case neither of those two are applicable, then on the basis of the foreign valuation.

American Selling Price Method

It was realized that by the application of the American selling price method several very good purposes would be served. First, the actual duty rates could be kept lower. In the second place, the duties paid could be put on a valuation more comparable with American costs, based on American wages to labor. In the third place, this system provides in itself an automatic method of duty reduction, because as the American selling price is lowered the duty on imported merchandise at the same time decreases proportionately by reason of the decreased valuation basis.

Now let us examine what effect this tariff policy in the case of dyes has had on the textile industry of the United States. In this connection I want to recall just for a moment the charges that were made at the time of the passage of this act, that it was virtually an embargo and that behind its protection there would come into being a great monopoly which could charge what it pleased for its products, and that in this respect the textile industry would be at its mercy. It was recognized at the time by those of us in the industry that this charge was most foolish in every respect, and that such a result could not possibly be and certainly what has happened since the passage of this act has amply proved that anything but a monopoly exists in the dye industry in the United States. Before leaving this particular thought I just want to emphasize to you something that is highly important and that perhaps is not often thought of. I can put it in the form of a question, as follows: If you assume that an American monopoly were possible, then which would you prefer, an American monopoly under the control of American courts, or a foreign monopoly which in most respects can operate completely independent as far as any such control as could be exercised over an American monopoly is concerned.

The next point I want to make is directly connected with this, because under the present Tariff Act there has been built up in the United States a dyestuff industry of which we are justly proud and this pride extends beyond the pride that we have in building up our own corporations to a successful standpoint. The greatest pride is in the kind of product and service that we can give to our customers, which as you know means the entire textile industry of the country. Now



Three Balls and Two Strikes.

the fact that we have built up an industry here and the further fact that monopolies are impossible under the Sherman Law is one of the greatest insurance policies that the American textile industry ever had; because so long as the American industry is maintained in a prosperous condition, just so long and no longer is the American textile industry free from absolute domination by a foreign monopoly in this field. News items

published from time to time show the progress toward world control in our industry by several large foreign cartels.

Just a word about this prosperity which is particularly appropriate in view of recent newspaper stories to the effect that the Senate Finance Committtee was considering the compulsion of large corporations to show their books and so justify their tariff requests. If such a procedure were followed in a fair and impartial manner it would confirm absolutely the representations we have made before Congress. I say fair and impartially advisedly because we are all familiar with the peculiar twisting and misinterpretation of true facts when handled by politicians solely for political purposes. The influence apparently meant to be made from some of the stories referred to is that a prosperous corporation is out of order in asking for an adequate tariff. Now as a matter of fact let us consider the two largest and most prosperous corporations in this field, Du Pont and Allied Chemical and Dye Corporation. Is their prosperity because of or in spite of dyes? An analysis carefully and fairly made would show that the great prosperity is in accompanying lines of business, and these corporations, therefore, instead of meriting censure or criticism deserve instead great credit for so building their corporations that they can afford to carry on their expensive development in the field of dyes, because of the financial sinews derived from other sources.

The Tariff and Dye Prices

Since the passage of the present Tariff Law with its special protection to the American synthetic organic chemical industry the prices of dyes to the textile mills have decreased every year, so that whereas the average selling price of all dyes in the United States for the year 1922 was 60 cents per pound, the average selling price in 1927 was 39 cents. The thing that has brought this about is competition among the various American producers, together with their greater efficiencies in manufacture, which also helps to make the lower prices possible. In connection with these low prices of dyes, as well as with the prosperous corporations referred to above, it is highly interesting to quote from a report of the United States Tariff Commission as follows: "It is doubtful whether in recent years the domestic industry as a whole has had a reasonable return on its capital investment as many dyes were sold at or near their cost of production."

At the time of the recent hearings in Washington it was asked what the necessity was for the present comparatively high duties on cheap products like Indigo and Sulphur Black. I allude to these because it best illustrates a very important point. In the case of these two low-priced dyes the present duties do seem to the casual reader to be exorbitant in that the duty bears so large a percentage proportion to the selling price of the finished product. However, here is the point—this adequate protection is the very thing that makes available to you gentlemen to-day the present low prices on Indigo and Sulphur Black; in other words, the domestic market was assured to the manufacturers of these products who could, as a result, expand their productions with confidence and these expanded productions quite naturally led to lower costs of production, and these lower costs in turn were passed on to the textile industry through the natural process of competition among different manufacturers.

Someone also asked whether it was not a fact that these two colors were sold by American manufacturers in India cheaper than they are sold in the American market. Yes, it is a fact that this is being done, but the prices in these foreign markets are being set by the foreign manufacturers, and the American manufacturers really deserve a great deal of credit for holding on to their business at these prices, which are to them disastrous. It seems quite apparent that these low prices in the foreign market are made for the express purpose of driving the American manufacturers out, and we must not forget that if and when they find it necessary to relinquish this amount of tonnage, then their productions in the United States will of necessity be more costly just in the proportion that they produce less, and if their costs are in this way increased you can easily see what the net result will be to the selling prices in our textile industry.

I could go on indefinitely quoting instances which would prove to you the accuracy of the statement before made, to the effect that the greatest insurance policy the American textile industry possesses is the American synthetic organic chemical industry. Do not forget in this connection that the selling prices of a large percentage of all dyes in the United States are to-day as low or lower than they were before the Great War, and I do not think it requires any stretch of the imagination for us to believe that they would not be so low if there was not a strong American producing industry.

The American theory has certainly worked out in this industry, because we pay very much higher wages than they pay for the same labor in Europe, and yet adequately protected against these lower foreign labor costs we have been able steadily to reduce our prices to the consumer.

You must not believe that we have the same kind of protection in all colors as we have in the cheap ones, because that is just where the shoes pinches terribly. We all know that the world-wide trend is toward faster colors in all lines. These are considerably more expensive to the manufacturer and very much more complex, which means multiplied labor costs throughout and whereas a 7-cent specific duty is considerable on a dye selling for 16 cents it is nothing at all on a dye selling for two or three dollars. It is in this field that the American industry is now devoting all of its efforts and only by adequate protection so that we can continue this development can we hope to repeat in this class of dyestuffs what we have already done in the cheaper classes in the way of price reductions.

It is interesting to note in closing, some of the protests and other comments that are being given publicity as coming from foreign nations and in this connection I do not believe that it is generally known that 63% of all imports in the United States by value come in on the free list and carry no duty at all. Besides, a very interesting observation is the comparison of the duties collected by the United States as compared with those collected by so-called free trade Great Britain. As Ashmun Brown recently pointed out in the Providence Journal, Great Britain with a population of less than 45,000,000 derived from its customs in 1928 about $610,000,000, while the United States, numbering 120,000,000 inhabitants, collected a trifle over $600,000,000 from this source. In other words, in amounts collected we are approximately the same; but the population of Great Britain is 45,000,000 against our 120,000,000. Not only are the British totals greater than the American, but the rates carried operate very severely against American products; a very good instance of this being the transfer from the burley tobacco district of Kentucky of a very sizable colony of Americans to the Province of Ontario. By reason of this migration of burley tobacco producers to Canada they get the benefit of Imperial preference and so can carry on their business with Great Britain.

NOTICE

Members should hereafter send their changes of address to the Secretary, Alex. Morrison, American Woolen Company, Andover, Mass., instead of to the AMERICAN DYESTUFF REPORTER. A copy of the old address should be sent with the new, and to prevent the loss of an issue of the REPORTER the Secretary should be notified as soon as possible.

COMMUNICATION

PROF. LOUIS A. OLNEY, August 1, 1929.

Chairman, Research Committee.

Dear Professor Olney:

The controversy now raging in the REPORTER about the abandoned plans for a research and experimental laboratory to be conducted under the direction of our association, has been of great interest to me and many of my friends, members of the association, who are engaged in the actual working end of the industry.

Following is our general opinion, based on an unbiased discussion of the situation and on first hand information of the finishing end of wools, silks and cottons.

We waive all discussion of the research end of the plan, because no one should question the usefulness of such research work if it is carried out in a manner that will be of general benefit to the entire textile industry and not to any one branch of it.

We honestly believe that an experimental laboratory conducted in an unbiased manner for the purpose of determining the facts about any chemical, mechanical, physical or electrical problems presented to it, would be of incalculable value to the entire textile industry of the United States, and therefore to us as part of this industry. Since any private laboratory of this type is primarily interested in making a profit for itself, the laboratory that we have in mind would have to be conducted under the supervision and control of an organization that has an official position and an unselfish interest in the textile industry, without any idea of monetary profit. The only organization of this nature is the American Association of Textile Chemists and Colorists.

Those of us who are engaged in the average daily work of the manufacturing or finishing departments are pretty well tied up with routine or production work and usually have no opportunities to investigate the hundreds of problems that are presented weekly by people who have something "new" or something "better" that will help us in our work. We hate to pass up anything which may have real merit, yet we cannot waste the time that is required to investigate offerings that are of no value. We realize that progress is being made very rapidly in almost all processes and supplies that the textile industry uses, but we have no means of keeping in touch with the worth-while progress without spending a great deal of time and effort in unworthy matters.

How valuable and wonderful it would be if we could receive unbiased and accurate reports upon everything that is being offered to us to-day.

How well we could use the time that we now waste in investigations that are of no value. How much more money we would earn for our employers, which would certainly be reflected in our increased earnings for ourselves, if we did not have to spend so much time in interviews, conferences, etc.

One reason why so many mills and finishing plants have no regard or respect for textile chemists is that they have been only too frequetly misled and brought to monetary losses by so-called chemists, working either for themselves or for firms whose standards are not high enough. Another reason is that the average chemist in the textile industry has been, sometimes unwillingly, made into a routine automaton whose main purpose is to protect his firm from unscrupulous suppliers. No one considers a watchman of very great earning value to a firm, and many of us have become near watchmen, and our earnings have suffered accordingly.

It is therefore up to our association to place its members in the positions that they should have as the advance guard of progress. One of the easiest and most beneficial ways of doing this is by the organization and operation of an official experimental laboratory. We believe that you and Dr. Killheffer had something along this line in mind when you made the original suggestion of an official laboratory.

Such a laboratory, instead of decreasing the existing opportunities for textile chemists, will very greatly increase them. Chemical reports are best and most economically interpreted and applied by chemists. Chemists relieved of tedious and discouraging routine work will take on a new lease of life and raise the entire standard of present day textile chemistry and its value to the whole mill, small or large. There will be opened fields for chemists that are now almost completely closed to them. This all will certainly be of great benefit to everyone in the textile industry who is or should be a member of our association.

We also believe that there are enough far-sighted mills, finishing plants and supply firms in the United States who would be willing to take care of the initial financing of whatever plan for an experimental laboratory the association would work out.

Very sincerely yours,

H. G. SMOLENS.

ASSOCIATION BADGES

The lapel button badge illustrated herewith is worn by members of the American Association of Textile Chemists and Colorists.

The three "rings" are enameled in red, yellow and blue, respectively, and the initials and border are brought out in gold. The general effect is exceedingly attractive.

Badges may be secured at $1.50 each by addressing the Secretary.

ALEX MORRISON,
American Woolen Co.,
Andover, Mass.

AMERICAN DYESTUFF REPORTER

Devoted to the use and application of dyestuffs and the mechanical equipment incidental thereto.

LOUIS A. OLNEY
PROFESSOR OF CHEMISTRY AND DYEING, LOWELL TEXTILE SCHOOL
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THE FASTNESS STANDARDS

LET no one believe that the task of standardizing an industrial process or product is an easy, simple task. The work behind every standard is involved and laborious. First, the need for the standard is recognized by the industry in general or more usually by some far-sighted group of technical men. Sometimes these men run against opposition to their ideas at the start, and their work is, in this case, delayed until the adverse sentiment can be overcome or silenced. Then the technical men retire to a laboratory and proceed to test the process or product under study. They test repeatedly, tirelessly, patiently, accurately, until they have determined the best process or the best form of the product.

This is the tentative standard. It may be all wrong. But it is at least the result of exhaustive laboratory tests. It is at least something to work upon, to revise or amend or modify. Therefore, it is submitted to the committee or association in the industry which first saw the need for the standard. It may be adopted. Usually it is. No standard is a real standard until it is adopted and used by the industry.

In this issue, in the Proceedings of the A. A. T. C. C., our readers will find some interesting reports on the standard fastness tests used by the largest dye manufacturers and many of the smaller firms. In most cases, it will be observed, these dye manufacturers have accepted the standards established by the Research Committee of the A. A. T. C. C. Could there be any more convincing testimony to the value of the labor which the sub-committees of this Association have put into their standardizing activities?

That these standards of dye fastness have found such practical and extensive application in the dye industry is a fact which leads us to expect even more valuable results to follow in the future the research work of the Association.

C. H.

LOST IN THE TARIFF FOG

A CORRESPONDENT asks in a rather sarcastic tone why so much space is devoted to news and comment on the tariff. The question is at least timely. It is also a question that stimulates thought. Almost anything said about the tariff is sure to stimulate thought. Why? Perhaps we can explain.

Every tariff seems to have the misfortune to be born in a fog. It is a fog of words. The words, furthermore, are not ordinary, every-day words, but the foggy words of politicians, statesmen and Congressmen. When this wordy fog is stirred up by debate and discussion in the newspapers and on the floor of Congress, it becomes thick like pea soup. It obscures all but a few high points in the tariff. It is this fog that makes such a mystery out of the tariff, and a mystery is always fascinating, a mystery always stimulates thought. But it is a fog that confuses, that drips with paradoxes, that makes things seem to be what they are not.

For example, we learn from a perusal of the current reports on the pending Smoot-Hawley Tariff Bill:

That it is merely a slight adjustment or limited revision of the 1922 Tariff.

That it carries increases in practically every schedule and proposes many dangerous and radical changes in the administrative provisions.

That it will surely be passed by Congress in the present extra session.

That it will not be passed until the regular session which convenes next winter.

That it will not be passed at all.

That the valuation basis of the tariff will eventually be United States value.

That the basis of valuation will eventually be American selling price.

That the flexible provision has been made more workable and intelligible, and is a valuable asset to the tariff.

That the flexible provision will be removed altogether because it is an absurd piece of legislation.

That importers have no kick whatever because the new tariff is favorable to their business.

That importers are given a raw deal in the new tariff.

That the Republican members of the Senate have agreed on all the main issues, such as agricultural protection, valuation and the flexible provision.

That the Republican Senators are flying at each others' throats over the tariff issues.

That the new tariff will aid agriculture.

That it neglects agriculture shamefully and gives all the cream to the industries.

That the tariff has ceased to be a political issue.

That the tariff is now the major political issue.

Ad infinitum.

Is there such a thing as a tariff expert?

THE ONLY INTELLIGENT PLAN

THE American dye manufacturers should feel grateful to the Senate Finance Committee for its wisdom in making no change in the basis of valuation for the rates in the dye paragraphs of the Smoot-Hawley tariff. American selling price valuation still stands as the base to be used in assessing duties on competitive dye imports.

In all comments on the tariff we have constantly stressed the great importance of retaining this American valuation base. We have persistently argued that it is the only fair and intelligent basis for the rates on dyestuffs, especially in view of the unusual condition in this industry caused by an increasing foreign competition in all the higher-priced dyes. Behind this competition is the full strength of a powerful line-up of cartels that link the major dye producers of Europe. There is no sign that this competition will be lessened.

Leaders in our dye industry have, without exception, long realized the importance of the proper valuation basis. Their attitude on this issue is fully justified in the opinion expressed by Senator David A. Reed in the course of a statement on valuation:

> In my judgment the adoption of a correct valuation basis is fundamental and infinitely more important than individual duties. The duties mean nothing if imported goods are to be constantly undervalued. Practically every nation in Europe uses a domestic value as the basis for the assessment of customs duties. It is time we did likewise.

We hope it is generally known, however, that there has been a strong sentiment in Washington against American valuation as now in operation on dye imports. Certain foreign sympathizers among those entrusted with drafting our tariff have even advocated a foreign value as the only proper basis for all rates in the tariff.

Since 1922 the coal tar dye paragraphs have enjoyed the protection of American selling price value for competing colors and United States value for the noncompetitive dyes. The recent adoption by the Republican members of the Senate Finance Committee of a proposal to shift the general valuation basis of the new tariff from foreign to United States (or domestic) valuation is very significant. It clearly affirms what the dye industry and many other industries have always contended, namely, that American tariff rates should be based on some form of *domestic* value and not on any form of foreign value.

Wherever foreign value has been used for commodities that are imported regularly in great quantities it has resulted in confusion and delay over the assessment of duties. The reason is that the foreign value plan calls upon our Tariff Commission to get its information *abroad* about the value of goods being imported into this country. To secure the correct information on foreign manufacturing costs and market prices from European countries that oppose our tariff system is a difficult and painful job. In fact, it is an almost impossible job because the sentiment of Europe is so strong against our tariff policy that very little co-operation is offered to our tariff investigators who have tried to learn something about foreign manufacturing costs. Either American valuation, as in the dye paragraphs, or United States value, as now adopted by the Senate Committee for all other schedules in the new tariff, greatly simplifies the work of the Tariff Commission and the daily routine of our overburdened customs appraisers.

BY THEIR FRUITS

IN the printed record of the hearings before the Senate Finance Committee considering the Tariff Act of 1929, there appears, beginning at page 150, the testimony of a man who, in stating whom he represented, skilfully failed to indicate his real interest and those for whom he actually spoke. He gave as his principals, organizations with American addresses, but left it to the American manufacturers and the Synthetic Organic Chemical Manufacturers' Association of the United States to inform the committee that he really appeared on behalf of the I. G. and its controlled American plants. The purpose of his appearance was to argue the desirability of greatly reducing tariff rates, and he undertook to show that the American industry, which he does not represent, no longer needs the assistance which only a proper tariff can give.

According to his testimony, our domestic dyestuff industry now supplies 97.8 per cent by poundage and 92.8 per cent by value of the domestic consumption of dyes of the class and kind which are manufactured in the United States. Disregarding some of pertinent facts in the situation, he argued that American valuation on dyestuffs is cumbersome and no longer neccessary, and that the multiple specific duty system should be eliminated. He made no mention of the fact that, under the present tariff, which was the method adopted by the United States to insure an American coal-tar industry, our domestic manufacturers have made highly creditable progress in both variety and quantity of dyes produced and with prices continually declining, nor that competition has been severe among domestic producers, with dye consumers reaping the benefit. He particularly avoided reference to the work which still lies before us, especially with respect to vat dyes, in the development and production of which protection similar to that which is now enjoyed is imperative. The charge is made that the present tariff plan is unsatisfactory in its operation. The witness overlooked that it has been in effect for six and one-half years, that according to his own testimony it affects but 25 per cent of the dyes imported, and that under it imports have increased until about 20 per cent of our consumption by value is now imported. The totals for the first six months of 1928 were 2,699,464 pounds, valued at $2,145,410. Corresponding figures for

the same period of 1929 are 3,267,478 pounds, worth $2,627,558.

In other words, as was to be expected, it was the biased testimony of one identified with the importing interests and with foreign manufacturers and not one who has at heart the welfare of the American industry and all that that means to the American people. Surely the committes in Congress will not be misled by such testimony.

But to us the important point in all this is that it offers further evidence of what may be expected from the American I. G. The prospectus issued by the National City Company undertook to show that the American I. G. was being organized to develop the American industry. Here we have evidence that the disruption of the American chemical industry is what is sought, if that can be accomplished through taking from that industry such protection as the tariff affords it. Its representative has appeared before the Senate Finance Committee and, relying upon his previous connection with the United States customs laboratory as evidence of his expertness, urges substantial lowering of tariff rates. Frankly, we had hoped for evidences of better faith on the part of the new organization.—*Industrial and Engineering Chemistry.*

Adequate knowledge of his own requirements and the type of rayon material best suited to his needs is becoming more and more indispensable to the manufacturer. A definite line of education is necessary to give the manufacturer fundamental facts regarding rayon, the process of making it, its adaptability of certain definite uses, its limitations, etc.—*E. W. France.*

Any process which aims at the production of a given article by the elimination of human labor as far as possible suffers from the disadvantage that once it is planned and put into operation it is out of date. It has the further disadvantage that its economic value depends largely upon its being kept in continuous operation. Directly the machine is stopped for any reason, or checked by the failure of what may apparently be the least important part of it, great losses are incurred.—*H. T. Tizard, "Science and the New Industrial Revolution," in Journal of the Textile Institute.*

Majority interest in the common stock of the Hartsville (S. C.) Print & Dye Works has been purchased by the U. S. Finishing Company. At a recent meeting of the directors, it was voted that stockholders receive three shares of common no par for one share of $100 par now held. The following officers have been elected: Henry B. Thompson, president; John G. Bausher and Henry B. Thompson, Jr., vice-presidents; Grant A. McClatchie, treasurer, and Robert W. Bole, secretary. Fred Voegeli was elected resident manager, while Samuel L. Hayes will remain superintendent.

SOUTHERN TEXTILE SCHOOLS REPORT PROMISING ENROLLMENT

With the approach of the fall term, enrollment has been steadily increasing at the textile schools of the North and South Atlantic States. An announcement issued last week by the Textile School of North Carolina State College declares that judging from the present prospects this institution will have an excellent attendance at its fall session, which opens September 20.

At least a dozen States will be represented by its students, this college states, and more than 20 men from other colleges have entered their names on the enrollment books for textile courses. "The demand for graduates of textile schools is constantly increasing," said Dean Nelson of North Carolina State College Textile School in a recent interview. "This is largely due to the rapid diversification of the industry and the scientific improvements which are constantly being made in machinery, methods of production and distribution."

George Gordon Osborne has been appointed Assistant Professor of Knitting and Designing at this Carolina textile school. Mr. Osborne is a graduate of Lowell Textile Institute with a degree of Bachelor of Textile Engineering. Upon graduation he was awarded the medal given by the National Association of Cotton Manufacturers for the highest proficiency in work of any student in his class during his four years. He was also elected to the Textile Honorary Fraternity at the Lowell Institute.

Clemson Adds to Faculty

Two instructors have been added to the faculty of the Textile Department, Clemson College, Clemson, S. C., due, it is stated, to the increase in enrollment there. W. E. Shinn has been appointed Professor of Weaving and Designing. For the past five years he has taught in the textile department of North Carolina State College, having graduated from that institution with B.S. and M.S. degrees. He has had wide training and experience in textile manufacturing processes and has made a special study of knitting, research and technical writing. He will also teach knitting in Clemson's textile department.

It is reported from Danville, Va., that the Riverside & Dan River Manufacturing Company is making preparations for the manufacture of fine combed broadcloths, and that it will do its own dyeing and finishing. It is understood that new equipment is being installed in this connection. Part of the new equipment involves the addition of a mercerizing plant, it is stated.

Technical Notes from Foreign Sources

RECOGNITION OF THE RAYONS BY MEANS OF ULTRA-VIOLET

By Dr.-Ing. M. Nopitsch

Translated from Die Kunst-Seide, 10,321 *ff.* (1928)

IT is of great importance for those who work with rayons to be able to recognize rapidly and surely the different kinds of fibers which occur in commerce. The different sorts are distinguished from each other strikingly by their behavior toward moisture, and toward conditions prevailing in the processes of dyeing and weaving, so that the spinner and the weaver must know exactly what kind of rayon they have before them in order that during weaving and the final working up and finishing of the weave no unpleasant disappointments may be experienced.

The rayons found to-day in commerce are, in a general way, designated according to their mode of formation, as 1, viscose; 2, cupro (copper-oxide-ammonia); 3, acetate (acetyl-cellulose); 4, nitro (denitrated) rayons, which last is manufactured only abroad; i. e., not in Germany.

Regarding the manner of manufacture of these different kinds, I do not need to concern myself, since these matters have already been discussed several times in this very journal (reference is made to an article by Dr. G. Luft, Die Kunst-Seide, pp. 175 ff., in the 1927 series), and further have been exhaustively dealt with in a series of excellent monographs and reference works.

The differentiative behavior of the artificial fibers toward dyeing has also been dealt with more than once in these pages (e. g., Koelliker, Die Kunst-Seide, 418 ff., of the 1928 series), so that I need only to mention the most important points as follows:

1. Nitro rayon shows only a slight affinity for substantive dyestuffs, but a strong affinity for the basics; it accordingly behaves in a way similar to that of the animal fibers.

2. Cupro rayon, of all the synthetic fibers, shows the greatest affinity for the substantive dyestuffs, but only a slight affinity for the basics.

3. Viscose rayon is dyed by substantive dyestuffs less strongly than is cupro, but with basics gives somewhat deeper dyeings than does cupro rayon.

4. Acetate rayon shows for these groups of dystuffs no affinity, or a weak one, for some individual basic dyestuffs, a fact which depends upon its character as a cellulose ester, and its decided inability to swell in contact with water; but it can be made capable of taking on these classes of dyestuffs by a preliminary mordanting.

So far as the behavior of the rayons toward water is concerned, it is known that their strength while wet is much less than when dry, the latter value being determined under ordinary conditions of atmospheric humidity; and that acetate rayon is distinguished from the other kinds by a slighter loss of strength on wetting. According to Obermiller, the relative values when wet are about as follows:

Cupro rayon	50 to 60%
Viscose	45 to 55% (35%)
Nitro	30 to 40%
Acetate	65 to 70%

in comparison with the dry strength. For further comparison may be added the corresponding values for wet strength, of:

Cotton	110 to 120%
Wool	80 to 90%
Silk	75 to 80%

According to investigations of the Elberfeld Silk Institute, the rayons show an average moisture content of a little over 11%; in the case of acetate rayon the moisture content is only about 5% (Biltz. Mell. Textil-Ber. 7, 163), because here the free hydroxyl groups have been esterfied. According to the RAL bulletins, the regain for acetate rayon is proposed as 6 to 8%. These differences in behavior toward atmospheric moisture and water are the cause of the technological behavior in spinning and weaving.

Of determinative distinctions and reactions for the different kinds of synthetic fibers we possess a considerable number, which in part are governed by the chemical constitution of the fiber in question (as the blue color with nitro rayon by the diphenylamine-sulphuric acid reagent from residual nitro groups), or the solubility in acetone of the acetate rayon, others depend upon the well-known dye-absorbing properties of the various silks, and are used above all for the distinguishing of viscose from cupro rayon, as, for example, Methylene Blue (Massot) (principally dyeing of the viscose), Naphthylamine Black 4B (Cassella), according to A. Herzog (deeper dyeing of the cupro rayon), Pelican No. 4001 (Guenther-Wagner), and Eosine Extra (I. G. Farbenindustrie A.-G.), according to the RAL bulletin, whereby cupro rayon is dyed deep blue and viscose red.

To these may be added the combustion test, which permits acetate rayon to be recognized by the pungent, acid odor and the fusing or sintering together of the fibers to a brittle, vitreous mass. The other rayons burn as does true cotton.

Their optical behavior is also of importance for the

recognition of the rayons; lateral view and cross section under the microscope, polarization phenomena as a result of their double refraction under the polarization microscope, and their structure as revealed under the ultra-microscope, afford important indications as to the nature of the rayon to be judged. (For more detailed information see A. Herzog's work, "Ueber Die Unterscheidung der natuerlichen und kuenstlichen Seiden").

All of the procedures mentioned, when employed in proper combination, make possible a positive recognition of the rayons, but are to a certain extent rather roundabout in nature. The microscopic picture of the synthetic fibers in lateral aspect, so rapidly to be obtained, is often not certain enough to make it possible to base thereupon a distinction between viscose and cupro rayon. Upon this determination depends the distinction between nitro (becoming blue with the diphenylamine-sulphuric acid reagent) and acetate rayon (the combustion test and solubility in acetone). The longitudinal striations under the microscope, typical of many viscose fibers, a purely optical phenomenon caused by the ragged cross-section, which is conditioned by the nature of the coagulating bath, are lacking in several finely fibrous viscoses, as in the case of Vistra fiber; so that other methods, as, for example, the dyeing test, must be used in addition.

It has now become possible to shorten our investigation essentially by employing the Analytic Quartz Lamp of the Quartz Lamp Company Hanau, and to establish luminescence colors characteristic for each kind of synthetic fiber, so that a more certain recognition of the silks is possible, so long as undyed fibers are studied. In the determination of dyed rayons by the dye-absorption method, we proceed, of course, by stripping the dyestuff as far as this is possible, and then dyeing anew with the "recognitive" dyestuff (see preceding paragraph on the use of certain named dyestuffs as tests). This method of stripping the dyestuff for viewing under the quartz lamp, i. e., viewing the *stripped* fiber under the quartz lamp, will not give good results alone, for we have observed that traces of bleached (or stripped dyestuffs remaining on the fiber oftentimes occasioned an unusually strong luminescence (as, for example, is the case with cotton), so that false conclusions as to the presence of another kind of fiber were drawn. Nevertheless, even in such cases, with our present method, we have often been successful in our determinations.

The usefulness of the Hanau model of quartz lamp rests upon the fact that the ultra-violet rays excite certain substances to self-luminescence, so that they emit an actual light of their own, so to speak, the wavelength of which is transposed in each case toward the red end of the spectrum, therefore into the visible part of the spectrum; this luminescence, as it is called, is all the more plainly recognizable, the more completely one shuts out all the "visible" rays (i. e., the rays whose wavelength lies in the visible part of the spectrum), originating in the ultra-violet lamp itself or from other light sources, as daylight or artificial light in the place of examination. In the Hanau lamp a mercury-vapor-in-quartz arc is used, which always emits many rays of the visible region, principally in the blue and violet, beside the invisible ultra-violet rays; these visible rays are filtered out by passage of the emission through a filter of Uviol black glass, which allows principally only the ultra-violet rays in the region of wavelength 300-400 to pass.

On observation of all available samples of rayons in this filtered light from the quartz lamp, we have observed the following facts:

Viscose rayons, in old and new samples, from the firms of Koeln-Rottweil, Glanzstoff, Kuettner, Agfa, Arnstadt, Eisenach, Herminghaus, Elsterberg, Zehlendorf, and Snia Viscosa, can be recognized by the sulphur yellow luminescence (lighter or darker, according to the purity and degree of bleaching) with so-called "shadows," which are caused by the reflection of the violet rays in the visible part of the spectrum, which are not entirely filtered out by the lamp filter.

Cupro rayon (Bemberg, Hoelken) displays a reddish-white, somewhat milkily turbid luminescence, with strongly bluish to bluish-violet shadows.

Nitro rayon luminesces with a distinct flesh color, and is always easily to be distinguished from viscose, which luminesces yellow; even in the case of viscose which shows a brownish color in daylight, and a luminescence, under the ultra-violet lamp, of a more or less straw-yellow color, the distinction is still sufficiently characteristic.

Acetate rayons display a very brilliant and very intense blue violet to true violet luminescence; the shadows are very strongly blue-violet.

A sthenose (a rayon treated with formaldehyde, to increase the resistance toward the action of water) was recognized on examination as a viscose so after-treated, by its light-yellow luminescence.

It is interesting, also, to observe under the quartz lamp the behavior of the rayons after being boiled out with alkaline liquids, or after several hours' extraction with ether, petroleum ether, or alcohol. Ether/petroleum ether has no particular effect upon the luminescence of rayons as a whole; this has some connection with the fact that the rayon, when spun, is frequently partly impregnated with substances of a fatty nature to increase its lubricity; substances which may themselves display a characteristic luminescence under the quartz lamp; and the connection is of importance, since it shows that the luminescence of the rayons is caused by characteristics of structural and not of superficial nature.

Alcohol of 96% has no influence upon the color tone of the luminescence of viscose and of cupro rayons; on the other hand, it strongly modifies that of acetate rayon; the luminescence of the latter becomes much duller and of a yellowish-gray. It modifies the color of acetate itself strongly in a manner which can be seen plainly by the eye, even in common daylight; the luster of the fiber

becomes dull and milkily turbid; in spots here and there the fibers cohere and become hard.

Soaps and ammonia water (5 g. each per liter) do not affect the luminescence of viscose or of cupro rayon, but cause acetate silk to become somewhat lighter and less blue in luminescence. In daylight a slight decrease in luster is to be noticed (with acetate).

Caustic soda liquor of 2.5° B., such as is used for the distinguishing of animal from vegetable fibers, affects the luminescence of viscose hardly at all, but makes cupro rayon somewhat grayer and reddish-violet in luminescence. Acetate rayon takes on a wholly different luminescence, owing to the fact that it is wholly saponified and changed materially in its mechanical structure; it loses its bluish luminescence completely and becomes light and weakly yellowish-white.

In the case of cupro rayon, and of viscose, luster and aspect of the fiber are little altered through the above-mentioned treatment; cupro becomes somewhat harder and "crackly."

The quartz lamp is also useful for rapid distinction of the rayon from true silk, since degummed silk shows a strong, light-bluish luminescence, which in every case is stronger than with the rayons. Raw silk is strongly influenced in its luminescence by its daylight color. If the bast is colored yellow, as in the Italian Grège, the silk also displays under the lamp a more or less light yellow luminescence.

As to the recognition of the other fibers I have recently reported (Mell. Textil-Ber. 1928, issues 2, 3 and 4), I can here only refer to them. To gain a general view of the average decrease in brilliancy of the luminescence of the common fibers, let me give the following tabulation:

1. Bleached wool (Zephyr Yarn) shows the strongest luminescence; it radiates a bright, bluish-white light. Daylight color, white.

2. Natural silk (Organzine, degummed), luminesces light-bluish. Daylight color, white.

3. Unbleached, light-colored wool (combing I) luminesces light-bluish, with intensity about as with 2. Daylight color, pale yellowish.

4. Sthenose (rayon treated with formaldehyde) displays a light-yellowish luminescence. Daylight color, pale brownish.

5. Mercerized and bleached cotton (pearl yarn) luminesces light-yellowish. Daylight color, white.

6. Acetyl cellulose (acetate rayon, Aceta G. m. b. H.) luminesces bluish-violet. Daylight color, white.

7. Roving (raw white No. 15) luminesces bluish, plainly inclining to yellow; luminescence partly overlaid by yellow. Daylight color, brownish-yellow.

8. American raw cotton (first quality 30 warp) luminesces weakly yellowish-white. Daylight color, pale brownish.

9. Cupro rayon (Bemberg silk) luminesces reddish-white with violet shadows. Daylight color white, glistening-opalescent.

10. Viscose rayon (Glanzstoff) luminesces sulphur-yellow with violet shadows. Daylight color, almost white.

11. Nitro rayon (600 to 800 denier, untreated) luminesces flesh color. Daylight color, yellowish-white.

12. Mako cotton (Mako 40 I brown) luminesces a weak brown. Daylight color, brown.

13. Marko cotton (as above, but boiled out with soda) luminesces a dark, obscured brown, with a pale violet shading. Daylight color, brown.

14. Unbleached mercerized Mako cotton (as above) luminesces a very dark, violet-shaded brown. Daylight color, brown.

Although the gray content of the luminescence colors increases from 1 to 14, as above, yet this increase is not regular. While, for example, the luminosities of 3, 4 and 5 show only slight differences in the samples available for examination, the "jump" (Sprung) from 12 to 13 is very great. In general, the degrees of luminosity can vary according to the quality of the samples examined. The above tabulation can be regarded as useful only for an approximate assistant to one's studies, and shows plainly what an influence the degree of purity (see wool) and treatment (see cotton) has upon the luminescence.

From what we have said, it is easy to see that, with the help of the ultra-violet radiation from the quartz mercury vapor lamp, the recognition of the different kinds of rayons is possible in an essentially shorter time than with the methods at present commonly in use.

The rate for "Position Wanted" advertisements in this column is 2 cents a word—with a minimum of 50 cents per insertion. For all other types of advertisements—i. e., help wanted, machinery or supplies for sale—the rate is $5.00 per column inch or less per insertion.

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